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DISEASES
OF
INFANTS AND CHILDREN
WITH THEIR
HOMŒOPATHIC TREATMENT.

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EDITED BY
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ASSISTED BY SEVERAL PHYSICIANS AND SURGEONS.

VOLUME I.

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PREFACE.

A work on the Diseases of Infants and Children, and their Homœopathic treatment, exhaustive, and up to date, in all of the departments has been greatly needed for some time; but the preparation of such a treatise at all completed and adapted to the wants of the Homœopathic profession was an undertaking from which all shrank. After waiting for others, and at the earnest solicitation of those interested in this branch, the editorship of the present work was undertaken, with many misgivings.

After the collection of the material, the next most important thing was the arrangement of the work. The diseases of infants being many of them developmental—but a continuation of ante-natal affections—it seemed necessary, as well as scientific, that we commence with development and its derangements. The importance of this part of the work will be apparent to all who have many new-born to manage.

It is very generally conceded by paedologists that dietetic errors are the great cause of infantile diseases. The food question being such a vital one it seemed necessary that the digestive organs and their diseases should receive careful and exhaustive consideration. Their development, anatomy, physiology, as well as pathology and etiology, have therefore received more than usual attention. Effort has been made to thoroughly analyze the foods for infants and children, and to simplify the indications for their use.

In the discussion of the diseases of the mouth, stomach and bowels, an endeavor has been made to tone down the prominence usually given to aphthæ, gastro-malacia and cholera infantum. Gastritis, and especially entero-colitis, have not received the attention their importance merits. Entero-colitis is the "summer complaint," while gastritis is more often met in spring and autumn. Indigestion is but a form of gastritis.

In 1869 when lecturing on the diseases of children in Hahnemann Medical College, and especially when having the care of the waifs in

PREFACE.

the new Foundling's Home, the necessity for more concise and complete analyses of the diseases peculiar to children, and more reliable objective symptoms of infantile disorders and their remedies, became painfully felt. Where no previous history of a case could be obtained, and when compelled to depend upon what could be seen, there were found some land-marks that served as reliable guides. These have proved valuable helps where the attendants were too ignorant or careless to give the necessary facts to form a diagnosis, make a prescription or direct the proper feeding. This will explain the prominence given to objective phenomena throughout this book.

While this volume is more complete than any similar one yet issued, still, the anxiety of the profession to obtain it, has induced us to hurry it out, thereby making it less cyclopædic in character than was at first contemplated. Like a vigorous child, however, "it can grow." Those able to and interested can aid in the feeding.

As it is impossible to tell the sources of all the facts and ideas that make up the grand bundle of literature on children's diseases, so it has been found difficult to label all the gleanings here incorporated from the 500 works consulted. To those who have assisted in this arduous labor, and especially to the physicians and surgeons who have kindly contributed to this volume we here present our grateful thanks.

May this work go forth, to arouse more interest in paedology, to be a help in time of need, and to aid in lessening the enormous infant mortality is the earnest desire of

THE EDITOR.

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A

PRACTICAL TREATISE
ON THE
DISEASES OF INFANTS.

GENERAL OBSERVATIONS.

THE period of infancy extends from birth until the eruption of the milk teeth. This is the most critical period of life, on account of the many and rapidly serious diseases incident thereto.

"This is a very important part of the practice of medicine, for one-third of all diseases belong to the age of infancy, and they constitute a particular branch of the healing art, that requires a special study. One may be a very good physician for adults, but a very unsuccessful one in the treatment of children; for the difference does not lie in a diminution of the strength of the doses, but in a different semeiology, a modified pathology, requiring corresponding therapeutics. The character is quite different, and ought to be understood."

Thus wrote Hufeland, in 1836, after fifty years of extensive observation and experience, (*Vide Enchiridion Medicum*, p. 529). What was true in that day is doubly true to-day, and especially in America, with its varied climates and peoples, and with Homœopathic practice.

Some writers place the number of cases of diseases of children, as high as one-half of a physician's practice. We suppose they will reach about one-third, in the higher walks of life, and perhaps as high as one-half, among the lower classes. The per cent will doubtless vary, also, with different physicians. The physician successful with children's cases will usually have plenty to do in that line.

Notwithstanding the large proportion of infantile diseases, this department is sadly neglected in all medical colleges. "Diseases of Children" is usually an appendage of some other chair, and the result is, that many students go out with a superficial knowledge of the diseases peculiar to childhood. A marked improvement has recently been manifest, especially in our Homœopathic colleges. This is proper, for children constitute a large proportion of our patients. Three out of four of the public institutions for children, in Chicago, are under Homœopathic care.

Formerly very few articles appeared in our periodical literature on the diseases of childhood, but recently, greater attention has been given to this department. The number of works on children's diseases have also increased in number and importance. In the very large collection in the Surgeon-General's library, Washington, D. C., I found only one hundred and forty volumes of all kinds and editions. Homœopathic books on the diseases of infancy and childhood are very few indeed. This work was undertaken with the idea of supplying, partially at least, this lack in our literature.

"Homœopathy is the treatment adapted to children," is an almost universal belief. We should therefore be thoroughly equipped to assume this great charge. It is firmly believed that Homœopathic treatment has greatly lessened the mortality among children. Professor Gatchell estimates that it has increased the expectancy of life 25 per cent. He thinks that when the teachings of Homœopathy have full sway, life will be prolonged 50 per cent. This is an age of great expectations, and we may live to see this devoutly to be hoped for time. To hasten that epoch we must know more of the art of preventing infantile diseases, by proper hygienic and therapeutic measures.

The periods of infant life that demand our closest attention are:

1. During ante-natal development.
2. During the first month.
3. The period of the first teething.
4. The first and second summers.

Many of the disease-tendencies are congenital. The greatest mortality of children, in all countries, occurs during the first month. Dentition completes the dependent age, and is as important as the subsequent age of maturity, i. e., from eighteen to twenty-five years. A very large mortality occurs during the first hot months. The dry, hot weather wilts children as it does plants.

To anticipate infantile diseases, we must be familiar with the peculiar organizations, and all the changes incident to embryonic, infant and child life. "For it is well known," says Billard, "that the form, functions, and peculiar constitution of animals depend on their organization, and the varieties presented by the infusoria, the mollusca, the vertebrata, and mammalia, are well known. If this proposition is true with regard to the different classes of organic bodies, it is also true with regard to the different individuals of the same class, or the same species, considered in the various changes occurring in their development. Thus the human ovum some days after conception, differs greatly from the foetus, the full-born infant, child, and the adult; by reason of the actual condition in which the materials entering into its composition reciprocally exist. The labors of anatomists go entirely to the support of this proposition.

"If all the functions of living, organized bodies, or rather, if the manner in which these functions are performed, be found in dependence on the organization, the alteration of the functions, or the diseases resulting from any disturbance in the organs, vary equally, according to the different subjects affected, and according to the different epochs in the life of the same subject.

"Thus, in proportion as the ovum, embryo, foetus, infant, child, and the adult, become more perfect in their organization, their functions undergo a peculiar change in a state of health, and likewise present corresponding peculiarities of symptoms in disease, the forms of which will change according to these different phases of organization. The embryo, being but a simple mass of cellular tissue and mucus, dries like a leaf from a tree, when any accidental cause detaches it from the body from which it derived its support. Furnished at a later period with an external covering and an internal canal, provided also with circulatory vessels and organs, and finally changed into a sensible and movable body, a new organization, new functions, and new symptoms of disease invariably present themselves; for the organization, functions, and diseases, are necessarily connected with each other, forming a succession of links, the whole of which constitutes life, considered in its origin and development, and also in its normal and abnormal state.

"From these considerations, then, it appears, as we shall see, that it is not after birth only, that man for the first time experiences that series of maladies which afflict his race, but that the origin must be sought in a much more remote source; it commences with the

organization; and the annals of science present at this day a number of facts, which attest that during intra-uterine life man often suffers many affections, the fatal consequences of which are brought with him into the world. *Children may be born healthy, sick, convalescent, or entirely recovered from former diseases.* This truth is of great practical importance, for, if after birth, children are affected with diseases, the progress of which was not interrupted at the period of birth, but on the contrary, the diseases continue to run their course, it may easily be conceived how important it is for the physician to be able to recognize the external signs they present, in order to arrest their progress, if it can be done. If it happen that a child is born convalescent from a disease that had existed during the intra-uterine life, it is evident again that great care will be necessary in such cases to protect and foster the wavering health of one in so debilitated a condition. And if the child be born after the disappearance of disease, the physician has still a task to perform; he ought, under such circumstances, to instruct the parents in the best method of restoring vigor to the exhausted constitution; the influence of a proper regimen will be all that will be necessary to enable the child to recover the energies of health."

The practical importance of a knowledge of the development of the embryo, of the diseases of the foetus, and of the malformations met at birth, have been overlooked by many writers on infantile diseases. These will be presented before proceeding to the consideration of the diseases incident to birth, and those developed subsequently, during the period of infancy.

ANTE-NATAL DEVELOPMENT.

GROWTH OF EMBRYO.

FETAL life is the period of organization of the body, normal or abnormal. From an ovum of less than a grain in weight is developed a living being of several pounds. All the delicate and various organs are formed and developed, during these nine months, to such a condition that independent existence is possible.

It is presumed that all infants are able to live, and under proper circumstances develop into vigorous adults, but I am satisfied that such is not the case, that many are immature, and, as with immature fruit, it is not possible for them to long survive.

Arrest of development may give us an impervious bile duct, oesophagus, anus, etc. In the celebrated Boston living skeleton the thoracic duct was found, after death, almost occluded. In many of the cases that died from supposed inanition at the Chicago Foundlings' Home, various malformations were found. The organization and development of the body is a most important study, with the details of which, the physician should be very familiar.

The whole body grows out of the fecundated ovum, and it is accordingly necessary, to a proper understanding of the numerous diseases of children, to follow standard authors in as few words as possible, the various stages in which the ovum is found in the uterus, from the earliest moment at which conception can be recognized as having taken place, down to the birth of the complete foetus.

In this description, the language of standard authors, chiefly Gray, will be adopted.

The ovum is a small spherical body, situated, in immature Graafian vesicles, near their centre, but, in the mature ones, in contact with the membrana granulosa, at that part of the vesicle which projects from the surface of the ovary. The cells of the membrana granulosa are accumulated round the ovum in greater number than at any other part of the vesicle, forming a kind of granular zone, the *discus proligerus*. The ovum is extremely minute, measuring from 1-240th to 1-120th of an inch in diameter. It is a cell, consisting externally of a transparent envelope, the *zona pellucida* or vitelline membrane.

Within this, and in close contact with it, is the yelk or *vitellus*; imbedded in the substance of the yelk is a small vesicular body, the *germinal vesicle* (vesicle of Purkinje)—the nucleus of the cell; and this contains as its nucleolus a small spot—the *macula germinativa*, or the spot of Wagner.

The *zona pellucida* or *vitelline membrane*, is a thick, colorless, transparent membrane, which appears under the microscope as a bright ring, bounded externally and internally by a dark outline. It corresponds to the chorion of the impregnated ovum.

The *yelk* consists of granules and globules of various sizes, imbedded in more or less viscid fluid. The smaller granules resemble pigment; the larger granules, which are in greatest number at the periphery of the yelk, resemble fat-globules. In the human ovum, the number of granules is comparatively small.

The *germinal vesicle* consists of a fine, transparent, structure-less membrane, containing a watery fluid, in which are occasionally found a few granules. It is about 1-720 of an inch in diameter, and, in immature ova, lies nearly in the centre of the yelk; but, as the ovum becomes developed, it approaches the surface, and enlarges much less rapidly than the yelk.

The *germinal spot* occupies that part of the periphery of the germinal vesicle which is nearest to the periphery of the yelk. It is opaque, of a yellow color, and finely-granular in structure, measuring from 1-3600 to 1-2400 of an inch.

The phenomena attending the discharge of the ova from the Graafian vesicles, since they belong to the ordinary functions of the ovary rather than to the general subject of the growth of the body, are omitted.

The first changes in the Ovum which take place upon conception, appear to be as follows: The spermatozoon penetrates the ovum, the effect of which is to bring it into contact with the yelk, and with the germinal vesicle contained in the yelk. (Newport *Philosophical Transactions* 1853, vol. ii. p. 233.) This has since been confirmed by other observers on various lower animals, and may be assumed to be generally true, (Gray). It seems as if this normally occurs in the Fallopian tube, and abnormally it may even take place in the peritoneal cavity. Many physiologists, as Bischoff and Dr. M. Barry, believe that the ovum is fecundated in the ovary, but the reasoning of Dr. Allen Thomson appears very cogent in proving that the usual spot at which the spermatozoon meets the ovum is in the tube. The first effect is to

produce a cleavage and multiplication of the yolk, which becomes first cleft into two masses, then into four, and so on, until at length mulberry-like agglomeration of nucleated cells results. It appears probable that this proliferation is due to some change in the germinal vesicle and its nucleolus, but the nature of such change has not been made out. Some observers describe it as consisting simply in the cleavage of the vesicle and nucleolus, others in their disappearance and replacement by a fresh cell, or nucleus, the *embryo-cell*, around which the yolk gathers. In this view the fertilization of the yolk is due to the solution of the germinal vesicle under the action of the spermatozoon.

There are also found within the vitelline membrane one or more clear globules, called "polar globules," by Robin, because they lie near one of the poles of segmentation. The nature, origin, and uses of these bodies are not known. They seem to be usually regarded as produced by the liquefaction of the yolk, and as not being essential to the process of fructification.

The globules of which the yolk is composed soon arrange themselves into the form of a membrane lined with pavement-epithelium. As the yolk-mass softens, fluid accumulates in the interior of this membrane, spreading it out on the internal surface of the vitelline membrane. The latter (external) membrane soon becomes covered with granulations or vegetations, giving it a shaggy appearance, and then takes the name of the "primitive chorion," whilst the internal membrane is called the "blastodermic vesicle."

The blastodermic membrane soon afterwards splits into two layers, the division proceeding from the point where the thickening or aggregation next to be described as the germinal area occurs, and extending gradually over the whole circumference of the ovum, which now consists of three concentric layers of membrane—the external, (the primitive chorion), the middle, (the external layer of the blastodermic vesicle), and the inner, its internal layer. It is said that the ovum is at this condition at about eight days, but no observations of the human ovum at so early a period exist. The internal layer of the blastodermic membrane next separates into two, at the situation of the *area germinativa*. The membrane which results from this separation is called the middle layer of the germinal or blastodermic membrane, and is distinguished from the others in not being coextensive with the embryo, but existing only at the germinal area.

In the mass of nucleated cells into which the yolk becomes converted

during the formation of the blastodermic vesicle, a small agglomeration is formed, which then spreads out into an area of nucleated cells, from which the embryo is to be formed, and which has accordingly received the name of *germinal disk* or *area germinativa*. In this portion of the ovum the first trace of the embryo appears as a faint streak, which is called the *primitive trace* or *primitive groove*. This groove first deepens into a furrow, bounded by two plates—the *laminæ dorsales*, beneath which a delicate fibril appears—the *chorda dorsalis* or *notochord*—in which cartilage can very early be recognized, and which forms the future spinal column.

The germinal disk is found to consist on a traverse section of three layers: an upper (external), or serous; a lower (external), or mucous; and a middle layer, which is formed from the mucous lamina, as above shown.

The *chorda dorsalis* and the *laminæ dorsales* are the rudiments of vertebral column and canal. The *upper* or *serous* layer of the embryo gives origin to the cerebro-spinal nervous centres, and to the organs of the senses, including the cuticle and appendages, as also to the mammary glands. From the *middle* layer are developed the locomotive organs, the spinal and sympathetic nerves, the vascular system, the ductless glands, the sexual organs, the cutis, where the middle layer touches on the external, and muscular and submucous coats of the intestines, where it touches the internal layer. The internal layer furnishes the lining of the alimentary canal and its various appendages, liver, pancreas, etc., the respiratory organs, and the urinary organs. Besides this, however, there are three appendages to the ovum, which must now be described—the *amnion*, the *umbilical vesicle*, and the *allantois*.

APPENDAGES OF THE EMBRYO.

The *amnion* is formed from the external, or upper, germinal layer, which is drawn on all sides by the changes of shape of the embryo. The embryo as it grows becomes curved at its anterior and posterior end, so as to form the *cephalic* and *caudal flexures*; it also curves on itself laterally, towards the umbilicus, and as it does so, it draws the external germinal layer with it, forming double folds which meet at the umbilicus, and at a point opposite to the umbilicus on the dorsal aspect of the embryo, sometimes called “the posterior umbilicus,” and finally communicate so as to form a delicate closed sac, into which a serous fluid—the *liquor amnii*—is secreted. This fluid increases in quantity up to about the end of the fifth or sixth month,

when it reaches the amount of two pints. Thence it diminishes, and at the end of pregnancy, is about half its maximum quantity. The outer layer of the amnion incloses all the parts of which the embryo consists, and is in contact externally with the chorion.

The portion of the external germinal layer which does not take part in the formation of the amnion is called the vesicula serosa. When the sac of the amnion is completely closed, the vesicula serosa becomes detached from it, and then forms an envelope for the ovum, lining the primitive chorion. Its future destination appears to be to form the epithelial layer of the secondary or permanent chorion.

The allantois is a projection from near the hinder part of the embryo, formed by the middle and internal germinal layers, and therefore continuous with the intestinal cavity. The lower part of this cavity becomes the *uro-genital sinus*, and it is to the urinary tract that the allantois mainly belongs. It projects out from the embryo through the same opening as the vitelline or umbilical duct. The lower part of the allantois which is contained within the embryo becomes the bladder; the upper part of its intra-embryonic portion is denominated the urachus; the extra-embryonic portion is divided into two parts, called the allantonic vesicle, or the epithelial portion of the allantois, and the fibrous or vascular portion. The allantois, which is the first simple serous membrane, becomes vascular over its whole extent about the fifth week, and its vessels communicate, as will be described presently, with those of the chorion, forming the vascular connection between the mother and the foetus. In the human foetus the allantoic vesicle is small, soon withers and disappears, and its vessels are soon limited to the two umbilical arteries and one vein.

The allantoic fluid is alkaline, and contains from one to four per cent. of solid matters—uric acid, urea, allantoin, sugar and saline matters.

Umbilic Vesicle.—The embryo itself in the earliest recognizable condition is, above stated, a mere streak, but it soon becomes curved at either end, corresponding with the head and lower extremity of the body; the lower part is, however, open, and from this a body projects which at first consists of the matter into which the yolk has been developed (yolk-sac), and later on is converted into a vesicular body filled with clear fluid (the umbilical vesicle), and communicating with the body of the embryo by a constriction, the umbilical intestine pro-

ceeds, this canal is closed, and umbilical vessel is then a closed sac, lying external to the amnion. It is formed mainly by the internal germinal layer, but has a lining derived from the middle layer. As the arteries developed in the middle layer grow they cover the umbilical vesicle, forming the *vascular area*, the chief vessels of which are the *omphalo-mesenteric*, two in number. The vessels of this area appear to absorb the fluid of umbilical vesicle, which dries up into a disk-like body attached to the amnion, and having no further function. The activity of the umbilical vesicle ceases about the same time (fifth or sixth week) as the allantois is formed. In fact, the umbilical vesicle provides nutrition to the foetus from the ovum itself, while the allantois is the channel whereby nutrition is conveyed to it from the uterine tissues. The umbilical vesicle, however, is visible, containing fluid up to the fourth or fifth month, between the amnion and chorion, with its pedicle and the *omphalo-mesenteric* vessels. The latter vessels then become atrophied, as the functional activity of the body with which they are connected ceases.

Sometimes, however, they remain, and interfere with the life of the infant, as is illustrated by the following interesting case, related by Dr. B. H. Cheney, of New Haven Conn.:

"In June, 1875, I was consulted by Mr. B., of a neighboring town, for my opinion in regard to his newly-born child. He brought with him a letter from the physician who had attended his wife in her confinement. His account of the case is as follows :

'At midnight I was called to attend Mrs. B. in labor, which was normal, excepting that half an hour or more elapsed after expulsion of the head before rotation and expulsion of the shoulders took place. Immediately upon birth I noticed a large tumor-like appendage attached to the umbilicus, which, from its color and strong pulsation, I took at first to be an aneurism. On closer examination I saw coils of intestine folded within the sac, which was thin and semi-transparent, so that the peristaltic motions and the distension of the intestines by gas could be plainly seen. The sac measured in circumference eleven and a half inches; its longest diameter corresponded with the umbilical cord, which was entirely upon one side of the sac, of sigmoid form, and intimately blended with it. I placed a ligature (around the umbilical cord) at the distal side of the sac, which was four to five inches from the umbilicus, and cut the cord. Diameter of the sac at the umbilicus, from one to one and a half inches; at three inches' distance, eleven to twelve inches, its shape ovoid. The sac is evidently the peritoneum. Upon making taxis to replace the intestines, only a small portion could be forced back, and this immediately protruded again into the sac. The attempt to force the intestines into the abdominal cavity caused pain and distress, and it was impossible to accomplish it. At what period the departure from the regular development in foetal life began, I cannot now say, but early, for the cord and peritoneum grew intimately together. However, at present writing, the child is alive, and apparently flourishing. The sac is somewhat increased in size, of a dark color, and opaque. On the

lower side, where the sac comes in contact with the surface of the abdomen, pus is forming in considerable quantity. Yours very respectfully,

N. B. BAYLEY.'

I subsequently visited this child, and found its appearance still more remarkable than the letter of Dr. B. had led me to expect. The sac containing a portion of the intestines was very large, extending considerably below the child's knees. It was impossible to say how much of the bowels were thus extruded, but I judge the greater part of the small intestine. The child was thin and anaemic, but took its nourishment well; the evacuations of both feces and urine were regular and normal, and the sleep good. Extensive inflammation had already begun in the sac when I first saw the child, and it gradually sank, and died on the twelfth day after birth. No post-mortem was made. The period at which the malformation took its rise must have been previous to the fourth or fifth week of foetal life, that being the time at which the umbilical vesicle is atrophied and cut off from the body of the embryo by the approximation of its cutaneous walls, forming the navel. A question of some scientific curiosity is, whether the primary circulation of foetal life through the omphalo-mesenteric vessels continued later in this case than usual, and by what abnormal vessels the placental circulation supplied the sac and its contents."—(*The United States Medical Investigator*, May 15th, 1876).

The Chorion.—The primitive chorion has already been described. It is formed by the vitelline membrane, which becomes covered with shaggy villous processes, and disappears about the fifteenth day, to give place to the secondary or permanent chorion. The latter is composed of two lamellæ, the external one of which is furnished by the vesicula serosa (or false amnion), and the internal by the fibrous layer of the allantois. This latter furnishes a vascular membrane, which is applied to the epithelial layer of the chorion (vesicula serosa). As the latter becomes villous by the development of tufts upon it (*shaggy chorion*), the bloodvessels of the internal layer pass into those tufts, forming the foetal portion of the placenta, and dipping through the decidua into the uterine sinuses of the maternal placenta.

The Decidua is formed from the mucous membrane of the uterus. Even before the arrival of the fecundated ovum in the uterus, the mucous membrane of the latter becomes vascular and tumid, and when the ovum has reached the uterus it is imbedded in the folds of the mucous membrane, which overlap, and finally completely encircle the ovum. Thus two portions of the uterine mucous membrane (decidua) are formed—viz., that which coats the muscular wall of the uterus, *decidua vera*, and that which is in contact with the ovum, *decidua reflexa*. The decidua does not extend into the neck of the uterus, which after conception is closed by a plug of mucous. The

decidua vera is perforated by the openings formed by the enlarged uterine glands, which become much hypertrophied and developed into tortuous tubes. It contains at a later period numerous arteries and venous channels, continuous with the uterine sinuses, and it is from it that the uterine part of the placenta is developed. The portion of the decidua vera which takes part in the formation of the placenta is called "decidua serotina."

The decidua reflexa is shaggy on its outer aspect, but smooth within. The vessels which it contains at first disappear after about the third month; about the fifth or sixth month the space between the two layers of the decidua disappears, and towards the end of intra-uterine life the decidua is transformed into a thin yellowish membrane, which constitutes the external envelope of the ovum.

The Placenta is the organ by which the connection between the foetus and mother is maintained, and through which blood reaches the foetus and is returned to the uterus. It therefore subserves the purposes both of circulation and respiration. It is formed of two parts, as already shown, viz., the maternal portion which is developed out of the decidua vera (serotina), and the foetal placenta formed by the villous chorion. Its shape in the human subject is that of a disk, one side of which adheres to the uterine walls, while the other is covered by the amnion. The villi of the chorion (or foetal placenta) gradually enlarge, forming large projections—"cotyledons"—which each contain the ramifications of vessels communicating with the umbilical arteries and veins of the foetus. These vascular tufts are covered with epithelium, and project into corresponding depressions in the mucous membrane of the uterine walls. The maternal portion of the placenta consists of a large number of cells formed by an enlargement of the vessels of the uterine wall, and conveying the uterine blood into close proximity to the villi of the foetal placenta, which dip into these cells. The interchange of fluids, necessary for the growth of the foetus, and the depuration of the blood, take place through the walls of these villi, but there is no direct continuity between the maternal and foetal vessels. The arteries open into the placental cells somewhat after the manner of the erectile tissue. The veins anastomose freely with one another, and give rise at the edge of the placenta to a venous channel which runs around its whole circumference—the *placental sinus*. This renders its separation somewhat easy, as occurs during jumping, falls, etc., giving rise to haemorrhage and sometimes the death of the foetus.

The *umbilical cord* appears about the end of the fifth month. It consists of the coils of two arteries (umbilical) and a single vein, united together by a gelatinous mass (gelatin of Wharton) contained in the cells of an areolar structure. There are originally two umbilical veins, but one of these vessels becomes obliterated, as do also the two omphalo-mesenteric arteries and veins, and the duct of the umbilical vesicle, all of which are originally contained in the rudimentary cord. The permanent structures of the cord are therefore those furnished by the allantois.

DEVELOPMENT OF THE EMBRYO.

The youngest human embryos which have been met with are two described by Dr. A. Thomson, in the "*Edinburgh Medical and Surgical Journal*, 1839," and in his paper references to the other extant descriptions of early ova will be found. The ova in question were believed to be of the ages respectively of twelve to fourteen days, and about fifteen days. The earliest ovum was 9-40 of an inch in diameter, when freed from some adherent decidua. The chorion presented a slightly villous appearance, and consisted of only one layer of membrane. On opening it the umbilical vesicle and embryo were found not to fill its cavity completely. The embryo was a line in length, and nearly 1-40 of an inch in thickness. The chorion was united to the embryo and umbilical vesicle by a thin tenacious web of albuminous filaments, formed probably by coagulation in the spirit in which it had been kept. There were no vessels on the umbilical vesicle. The abdomen of the embryo presented no appearance of intestine, but merely a long shallow groove, forming a common cavity with the yolk-sac. Around this intestinal groove the germinal membrane was continuous with that on the surface of the yolk-sac. One extremity of the embryo, probably the cephalic, was enlarged, but this the author believed to be accidental. A more opaque and expanded portion between the cephalic, extremity and the surface of the yolk-sac appeared to him to indicate the rudimentary heart.

The second embryo was in a slightly more advanced condition. In it, as in the former, the amnion and allantois were not found, though the adhesion of the embryo by its dorsal aspect to the inner side of the chorion renders it probable that the amnion was formed. The cephalic and caudal extremities could be easily distinguished; the vertebral groove appeared to be open in its whole extent; there was a more perfect intestinal groove than in the former case, and

there was an irregular shaped mass between the yolk and the cephalic extremity of the embryo, which Professor Thomson believed to be the rudiment of the heart. No distinct trace of the omphalo-mesenteric vessels could be observed.

In an embryo of fifteen to eighteen days, described by Coste, the villi of the chorion were well formed, the umbilical vesicle communicated largely with the intestine, and the allantois was present, united to the inner surface of the chorion, and communicating by a large pedicle with the intestine. Both the allantois and umbilical vesicle were vascular. The amnion was not yet closed.

In ova of the third and fourth week the amnion has been found closed, the rudiments of the eye, ear, maxillary projections, pharyngeal arches, cerebral vesicles, anterior and posterior extremities, liver and umbilical cord are observed.

The further development of the embryo will perhaps be better understood if we follow as briefly as possible the principal facts relating to the chief parts of which the body consists, viz., the spine, the cranium, the pharyngeal-cavity, mouth, etc., the nervous centres, the organs of the senses, the circulatory system, the alimentary canal and its appendages, the organs of respiration, and genito-urinary organs.

DEVELOPMENT OF THE SPINE.

The first trace of the future spinal column is found at a very early period of foetal life, constituting the *chorda dorsalis* or *notochord*. This is a cylindrical tube, composed of a transparent sheath, containing embryonic cells, and extending from the cephalic to the caudal extremity of the foetus below the spinal canal. The *proto-vertebræ* or *primitive vertebræ* appear early, as dark spots, which soon enlarge and form quadrangular laminæ, one on either side of the *chorda dorsalis*, commencing in the cervical region. These spread out and bend towards each other, so as to come into contact around the spinal canal and inclose it, forming the rudiment of the future bodies and arches of the vertebræ, as well as of the vertebral and other muscles. This primitive vertebral column is, however, entirely membranous until about the sixth or seventh week, when the cartilage begins to be deposited in it. The *proto-vertebræ* do not coincide with the permanent vertebræ. On the contrary, each primitive vertebra separates into two parts, the upper part belonging to the permanent vertebra, which lies above the point of separation, and the lower one to that below. The *chorda dorsalis* becomes gradually atrophied, except at the part corres-

ponding to the intervals between the permanent vertebrae, where it forms the intervertebral disks.

DEVELOPMENT OF THE CRANIUM.

The foetal cranium is developed from the primitive vertebral disks surrounding the upper extremity of the chorda dorsalis. These advance in the form of a membranous capsule, which covers the end of the chorda dorsalis, forming the rudiment of the base of the skull, and moulds itself on the cerebral vesicles, so as to constitute the membrane in which the vault of the skull is developed. The membranous capsule presents at the base of the skull two thickenings (lateral trabeculae of Rathke) directed forward, and inclosing an opening (pituitary opening) which is partly closed by a thinner membrane—the middle trabeculae. The upper end of the chorda dorsalis terminates in a pointed extremity, which extends about as far forward as the body of the sphenoid bone, where it becomes lost about the situation of the pituitary body. The membrane becomes replaced by cartilage in the part corresponding to the base of the skull and the trabeculae. A portion of this primitive cartilaginous cranium becomes atrophied and disappears, a portion persists—forming the cartilages of the nose, and those of the articulations; the rest forms the cartilaginous nidus of the basilar part of the occipital, the greater part of the sphenoid, the petrous and mastoid portions of the temporal, the ethmoid bone, and the septum nasi.

DEVELOPMENT OF THE FACE.

As the cerebral extremity of the foetus grows, it becomes twice bent forward on its own axis. The upper or posterior curvature is called the cerebral; the lower or anterior, the frontal protuberance. From the anterior end of the chorda dorsalis four prolongations proceed on either side, and meet in the middle line. These are the pharyngeal arches, and in them, and in the frontal protuberance, certain bones are developed, which are called secondary bones, to distinguish them from those above enumerated, which are formed from the primitive cranium itself. Between the first pharyngeal arch and the frontal protuberance is situated the buccal depression, which afterward becomes the cavity of the mouth. The frontal protuberance next gives off two lateral parts (lateral frontal protuberances), on each of which a depression is formed, the olfactory fossa, bounded on either side by the internal and external nasal processes. There is a groove external to the external nasal processes, which afterward is trans-

formed into the lachrymal canal, and another groove leading from the olfactory fossa to the buccal cavity — the nasal groove.

The first pharyngeal arch divides at its anterior extremity into two parts — a superior and inferior maxillary protuberance. The latter unites very early to its fellow of the opposite side, to form the lower jaw. The superior maxillary protuberances are displaced outward, and unite to the external nasal process; from this part are developed the internal plate of the pterygoid process, the palate bone, the superior maxillary, and the malar. The lateral masses of the ethmoid, the os unguis, and nasal bones, are furnished by the internal nasal procees. The rest of these processes on either side are united into a single protuberance, the incisive tubercle, from which the intermaxillary bone and the middle of the upper lip are formed, and, according to some, the vomer.

Besides the lower jaw, the inferior maxillary protuberance furnishes a transitory cartilaginous mass — the cartilage of Meckel — from which the malleus and incus are formed. The remains of Meckel's cartilage persist as long as till the end of the seventh or the eighth month of foetal life, in the form of a rod of cartilage lying inside the lower jaw. From the second pharyngeal arch are formed the stapes and stapedius muscle, the pyramid, the styloid process, the stylo-hyoid ligament, and the small cornu of the hyoid bone. The great cornu and body of the hyoid bone are developed from the third arch, while the fourth pharyngeal arch enters merely into the formation of the soft parts of the neck, and does not give origin to any special organ. The pharyngeal or branchial fissures are four in number, the fourth being situated behind or below the fourth arch; the first persists, though only in a portion of its extent, forming the Eustachian tube, the meatus auditorius, and the tympanic cavity. The other fissures are wholly closed by the sixth week.

DEVELOPMENT OF THE PALATE.

The buccal cavity is at first common to the mouth and nose. Then a lamella is given off from the superior maxillary tuberosity on either side, which is directed horizontally inward. These two palatine lamellæ meet in the median line, in front, about the eighth week, and by the ninth week the septum should be complete. The superior maxillary bones proper, and the soft parts covering them, unite at an early period with the incisive bone, and the median portion of the lower lip. The olfactory fossæ open into the upper (respiratory)

portion of the cavity, forming the nostrils. It will be noticed that the various forms of harelip correspond to various interruptions of the process of union; thus the ordinary single harelip on one side of the median line results from the mere absence of union on that side, between the soft parts which cover the incisive bone and those connected with the proper superior maxillary; if this occurs on both sides, we have the simplest form of double harelip; if besides this, the intermaxillary bone remains ununited, it usually is carried forward at the end of the vomer, forming the double harelip, complicated with projection of the intermaxillary bone; if, added to this, the palatine lamellæ also remain ununited, we have the complete degree of fissured palate and harelip. Fissure of the soft palate only, or of the soft, and a portion of the hard, represent various degrees of non-union of the palatine lamellæ.

DEVELOPMENT OF THE NERVOUS CENTERS.

The medullary groove just described, presents about the third week, three dilatations at its upper part, separated by two constrictions, and at its posterior part another dilatation called the rhomboidal sinus. Soon afterward, the groove becomes a closed canal (medullary canal), and a soft blastema is deposited in it which lines it, corresponding to its dilatations, and, like it, assuming a tubular form. This is the rudiment of the cerebro-spinal axis. As the embryo grows, its cephalic part becomes more curved, and the three dilatations in the anterior end of the primitive cerebro-spinal axis become vesicles distinctly separated from each other. These are the cerebral vesicles—anterior, middle, and posterior. The anterior cerebral vesicle (situated at this period quite below the middle vesicle), is the rudiment of the lateral and third ventricles, and of the parts surrounding them—viz., the cerebral hemispheres, optic thalami, corpora striata, corpus callosum, fornix, and all the parts which form the floor of the third ventricle. The middle vesicle represents the aqueduct of Sylvius, with the corpora quadrigemina, and the crura cerebri. The posterior vesicle is developed into the fourth ventricle, and its walls form the cerebellum, pons varolii, medulla oblongata, and parts in the floor of the fourth ventricle. The antero-posterior fissure which indicates the division of the brain into two halves, appears early, and the primary anterior and posterior cerebral vesicles are also soon divided by a transverse fissure into two parts, so as to constitute five permanent rudiments of the brain and medulla oblongata. The middle primary vesicle remains undivided.

The anterior part of the anterior cerebral vesicle (*Vorderhirn*, fore brain), constitutes the cerebral hemispheres, corpus callosum, corpora striata, fornix, lateral ventricles, and olfactory nerves. These parts lie at first quite covered and concealed by those formed from the middle vesicle, and by the optic thalami, which, with the optic nerves, the third ventricle, and the parts in its floor, are furnished by the posterior portion of the anterior vesicle (*Zwischenhirn*, intermediary brain). By the third month, the hemispheres have risen above the optic thalami, and by the sixth month, above the cerebellum. Fissures are seen on the surface of the hemispheres at the third month, but all except one, disappear. This one persists, and forms the fissure of Sylvius. The permanent fissures for the convolutions do not form till about the seventh or eighth month. The middle cerebral vesicle (*Mittelhirn*, middle brain), is at first situated at the summit of the angle. Its surface, at first smooth, is soon divided by a median and transverse groove into four tubercles (*tubercula quadrigemina*), which are gradually covered in by the growth of the cerebral hemispheres. The cavity diminishes as its walls thicken, and contracts to form the aqueduct of Sylvius. The development of the pituitary body is still a matter of question. The crura cerebri are also formed from this vesicle. The third primary cerebral vesicle is divided at an early period (between the ninth and twelfth week) into two, the anterior part (*Hinterhirn*, hinder brain), forming the cerebellum, and a membrane (*membrana obturatrix*), which closes the upper part of the fourth ventricle, and which disappears as development progresses; its posterior part (*Nachhirn*, after-brain) forms the medulla oblongata, with the restiform bodies and auditory nerves.

DEVELOPMENT OF THE SPINAL CORD.

When the medullary groove is closed, the fœtal spinal marrow at first occupies the whole of the canal so formed. It presents at first a large central canal, which gradually contracts, and in after life is no longer perceptible to the eye, though it is still visible on microscopic sections. After the fourth month, the spinal column begins to grow in length more rapidly than the medulla, so that the latter no longer occupies the whole canal. The ganglia, and anterior roots of the nerves are perceptible at the fourth week, the posterior roots at the sixth. The cord is composed at first entirely of uniform-looking cells, which soon separate into two layers, the inner of which forms the epithelium of the central canal, while the outer forms the central gray

substance of the cord. The white columns are formed later; their rudiments can be detected about the fourth week. The central canal of the spinal cord is at first unclosed behind, except by the epithelial layer, but at the age of nine weeks the medullary substance is united here also. The ganglia appear to be developed from the protovertebral disks, and it is possible that the posterior roots also are; the anterior roots proceed from the medulla itself. The development of the nerves has not yet been followed. The sympathetic can be seen as a knotted cord at the end of the second month.

THE MENINGES.

The cerebral and spinal membranes are also, according to Kolliker, a production from the protovertebral disks, and are recognizable about the sixth week. As the fissures separating the parts of the cerebro-spinal axis appear, the membranes extend down them, and the pia mater passes into the cerebral ventricles. Bischoff, however, describes the pia mater and arachnoid as developed from the cerebral vesicles, and formed in the position which they permanently occupy.

DEVELOPMENT OF THE EYE.

The first rudiment of the eye is seen about the third week, in a vesicle (primitive ocular vesicle), which communicates with the first cerebral vesicle, and after the latter is divided into two, communicates with its posterior division — the *Zwischenhirn* or intermediary brain — by a hollow stalk, which afterward becomes the optic nerve. This primitive ocular vesicle, derived from the cerebral mass, is invested by a layer from the epidermic lamina of the blastoderma; from the latter layer are derived the conjunctiva, the epithelium of the cornea, and the crystalline lens; while the cephalic layer gives origin to the vitreous body, the fibrous coat of the eye (sclerotic and cornea), the choroid and iris, and the retina.

The lens is formed by a thickening of the epidermic layer, opposite to the primitive ocular vesicle, by which that vesicle is at first depressed, and then reversed; so that the cavity of the primitive ocular vesicle is finally obliterated. As this process takes place, a secondary cavity (secondary ocular vesicle) is formed between the rudimentary lens and the coats of the reversed primitive vesicle, and in this space the vitreous humor is secreted.

The lens is at first a mere depression in the epidermic layer. When this is closed, the lens becomes a vesicle, formed of epithelial cells, which grow and all its cavity, becoming gradually transformed into

fibres. It is at first surrounded by a vascular membrane — the vascular capsule of the lens — which is connected with the termination of the temporary artery (hyaloid) that forms the continuation of the central artery of the retina through the vitreous chamber. This vascular capsule of the crystalline lens forms the membrane pupillaris and attaches the borders of the iris to the capsule of the lens. It disappears about the seventh month.

The sclerotic and cornea, except the epithelial layer of the latter, are formed from the outer layer of the reversed primitive ocular vesicle, the retina from the inner layer; the pigment of the choroid is also derived from the inner layer, its proper tissue from one of these layers, but which, has not yet been determined. The cavity of the primitive ocular vesicle disappears as that of the optic nerve does.

The eyelids are formed at the end of the third month, as small cutaneous folds, which come together in front of the globe and cohere. This union is broken up, and the eyelids separate before the end of foetal life.

The lachrymal canal appears to result from the non-closure of a fissure which exists between the external nasal process and the maxillary process.

DEVELOPMENT OF THE EAR.

The first rudiment of the ear appears about the same time as that of the eye, in the form of a vesicle (primitive auditory vesicle,) situated close on the outside of the third cerebral vesicle, though not communicating with it. It is formed by a depression of the epithelium over the second pharyngeal arch, which becomes converted into a closed sac. From this vesicle the internal ear is developed. The auditory nerve is described either as a projection from the third cerebral vesicle, or as an independent formation which unites with both, and thus establishes a communication between the cerebral and the auditory vesicles. The middle ear and Eustachian tube constitute the remains of the first pharyngeal or branchial cleft. The formation of the ossicles of the tympanum has been already pointed out, viz., the incus and malleus from Meckel's cartilage, and the stapes, with its muscle, from the second pharyngeal arch. These parts project into the first pharyngeal cleft, which remains occupied by connective tissue during the whole of foetal life, according to Kolliker. The membrana tympani forms across the cleft, dividing it into an outer and inner portion. The pinna, or external ear, is developed from the soft parts covering the first pharyngeal arch.

DEVELOPMENT OF THE NOSE.

Two fossæ (olfactory fossæ) have been already spoken of, which are found below and in front of the ocular vesicles and the upper maxillary projection. They appear about the fourth week. Their borders become prominent, and the fossæ deepen, except at the lower part, where they lead by a groove (olfactory groove) into the buccal cavity. This groove is bounded by the internal and external nasal process. As the superior maxillary projection increases, the olfactory groove is transformed into a deep canal, the rudiment of the two superior meatus of the nose. As the palatine septum is formed, the buccal cavity is divided into two parts, the upper of which represents the inferior meatus of the nose, while the lower forms the mouth. The soft parts of the nose are formed from the coverings of the frontal projection, and of the olfactory fossæ. The nose is perceptible about the end of the second month. The nostrils are at first closed by epithelium, but this disappears about the fifth month. The olfactory nerve, as above pointed out, is a prolongation, at first in the form of a hollow stalk, from the anterior cerebral vesicle.

DEVELOPMENT OF THE SKIN, GLANDS AND SOFT PARTS.

The *epidermis* is produced from the external, the true skin from the middle blastodermic layer. About the fifth week, the epidermis presents two layers, the deeper ones corresponding to the rete mucosum. The subcutaneous fat forms about the fourth month, and the papillæ of the true skin about the sixth. A considerable desquamation of epidermis takes place during foetal life, and this desquamated epidermis, mixed with a sebaceous secretion, constitutes the *vernix caseosa*, with which the skin is smeared during the last three months of foetal life. The *nails* are formed at the third month, and begin to project from the epidermis about the sixth. The *hairs* appear between the third and fourth month, in the form of a depression of the deeper layer of the epithelium, which then becomes inverted by a projection from the papillary layer of the skin. The papillæ grows into the interior of the epithelial layer, and finally, about the fifth month, the foetal hairs (*lanugo*) appear first on the head, and then on the other parts. These hairs drop off after birth, and give place to the permanent hairs. The sudoriferous and sebaceous *glands* are also formed from the epithelial layer about the fifth and sixth month respectively. The mammary gland is also formed from the deeper layer of the epithelium. Its first rudiment is seen about the third month, in the form of a small

interventricular septum, so as to leave an orifice (auriculo-ventricular) on either side. The auricular septum, however, is not complete projection, from which others radiate, and which then give rise to the glandular follicles and ducts. The development of the former, however, remains imperfect, except in the adult female, and especially after pregnancy.

The *muscles* become visible about the seventh or eighth week. The source of their development is not completely determined, for the muscles of the limbs. The vertebral muscles appear to be developed from the "muscular laminæ" of the primitive vertebral disks, and the muscles of the neck and jaws, as well as those which inclose the cavities of the thorax and abdomen, are also formed from the same source. They do not meet in the middle line of the body till about the fourth month. The cutaneous muscles are developed from the cutaneous portion of the middle blastodermic layer.

DEVELOPMENT OF THE HEART AND GREAT VESSELS.

The first trace of the *heart* is found about the tenth or twelfth day, in the form of a mass of cells proceeding from the middle layer of the blastodermic vesicle, and the anterior wall of the intestinal cavity. It soon forms a bent tube, lying in front of the embryo, and only connected to it by its vessels. The heart is situated at first at the anterior end of the embryo, lying opposite the last two cerebral vesicles. As the head is developed, the heart falls, as it were, backward, to the lower part of the neck, and then to the thorax. It fills the whole thoracic cavity about the second month. As the lungs and thoracic parietes form, the heart assumes its permanent position. The tube is soon curved into the shape of the letter S, the arterial part being situated above, in front, and to the right, the venous below, behind, and to the left. Traces of the auricular appendages are early perceptible on the venous part. Then the walls of the ventricular portion begin to thicken in regard to the auricular part. The ventricle is separated by a constriction from the dilated part above, which corresponds to the aortic sinus or bulb, and from the posterior or auricular dilatation. Then each of these three parts becomes subdivided by a septum. After the completion of the ventricular septum the auricular is commenced. The septum ventricorum is at first almost transverse, and divides off a smaller portion (the right ventricle) from the common cavity. This septum is complete about the eighth week, and then the interauricular begins to grow, commencing from above and behind, and coalescing with the edge of the

interventricular septum, so as to leave an orifice (auriculo-ventricular) on either side. The auricular septum, however, is not complete during foetal life, but leaves an aperture (foramen ovale) by which the two auricles communicate.

The heart is at first composed of a mass of foetal cells, but its rhythmic contractions can be observed, even in this condition, before the development of any muscular fibres, and even, according to some authors, before it is in connection with any vessels.

Arteries.—The vessels which are in communication with the foetal heart, are as follows : In its earliest state, the circulation is external to the embryo. This primitive circulation appears about the fifteenth day, and lasts till the fifth week. It consists of two arteries, the first aortic arches, which unite into a single artery, running down in front of the primitive vertebræ, and in the walls of the intestinal cavity, and joining in a single artery, which again divides into two *primitive aortæ* or *vertebral* arteries, and these give off five or six *omphalo-mesenteric* arteries, which ramify in the germinal area, forming, with their parent trunks; a close network, terminating in veins, which converge toward a venous trunk, the *terminal sinus*. This vessel surrounds the vascular portion of the germinal area, but does not extend up to the anterior end of the embryo. It terminates on either side in a vein called *omphalo-mesenteric*. The two *omphalo-mesenteric* veins open by a single trunk into the auricular extremity of the heart. This primitive circulation extends gradually from the germinal area over the whole of the umbilical vesicle, and disappears as the latter becomes atrophied. In a more advanced state of the embryo, the position of this first pair of aortic arches corresponds to the first pharyngeal arch. Next in succession, other pairs of arches are formed behind the first. The position of the first four of these aortic arches is behind the corresponding pharyngeal arches, and that of the fifth behind the fourth pharyngeal cleft. The total number is five, but the whole five pairs do not exist together, for the first two have disappeared before the others are formed. These two have no representatives in the permanent structures. The third pair gives origin to the carotids, the fourth pair forms the innominata and subclavian on the right, the arch of the aorta and subclavian on the left. The fifth forms on the left side the pulmonary artery, the ductus arteriosus, and the descending portion of the thoracic aorta. Its right branch disappears.

The ascending portion of the arch of the aorta, and the root of the

pulmonary artery, are at first blended together in the common dilatation (aortic sinus), which has been above spoken of as connected with the ventricular end of the rudimentary heart. The septum which divides this common artery into two, begins to appear very early, even before the interventricular septum.

The descending aorta appears to be the remnant of the artery formed by the union of the two primitive aortæ. The omphalo-mesenteric arteries, which spring from these latter, all disappear except one, which remains as the superior mesenteric artery. The umbilical arteries are at first the terminations of the two primitive aortæ, but when these vessels are united into one, the umbilical arteries appear as branches, and the aorta itself ends in a caudal prolongation, which afterward becomes the middle sacral. The common and internal iliac arteries are the only permanent remains of the umbilical arteries.

Veins.—The primitive venous circulation has been described above, the two omphalo-mesenteric veins opening by a common trunk into the lower end of the tube, which represents a heart. The next stage of the venous circulation is, that at about four weeks there is found a single vein lying behind the intestinal cavity (not in front of it, as the temporary omphalo-mesenteric veins do) and receiving the trunk vein from the intestine (mesenteric). Two umbilical veins are early formed, and open together into the common trunk of the omphalo-mesenteric vein. They receive branches from the allantois, and anterior surface of the embryo. The right vein soon disappears; the left umbilical vein, on the contrary, grows till it becomes the trunk vessel into which the omphalo-mesenteric vein and its mesenteric branch appear to open. Next the liver begins to be formed around the umbilical vein, and then this vein sends branches into that gland (afferent veins) which afterward become the portal veins in the interior of the liver, and which give origin to other veins (efferent), which return the blood from the liver, and form afterward the hepatic veins. The portion of the umbilical vein between the giving off of the future portal vessels and the reception of the hepatic, forms the ductus venosus. The mesenteric vein communicates at first with the omphalo-mesenteric; when the veins of the liver are formed, the omphalo-mesenteric is transferred from the umbilical vein to the right afferent hepatic. A portion of it persists, and forms the trunk of the portal vein.

The systemic veins are developed from four trunk veins, two on

either side, above and below, which appear before the formation of the allantois or the umbilical vessels. These unite into one canal on either side (canal of Cuvier), which open into the common trunk of the omphalo-mesenteric veins, and so into the auricular portion of the rudimentary heart. These four primitive veins lie, two of them in front, the anterior cardinal, or jugular veins, and the other two behind, the posterior cardinal veins. As the umbilical vein increases, and the omphalo-mesenteric diminishes in volume, the sinuses of Cuvier are transferred to the former vein, and when the inferior cava is formed, and the umbilical vein becomes merely its tributary, the sinuses of Cuvier open into the inferior vena cava. At a later period the portion of the vena cava inferior, between the opening of the sinuses of Cuvier and the auricle, disappears, and then the auricle receives three veins, viz., the inferior cava, and the two sinuses of Cuvier, which are now called right and left superior vena cava. The superior cardinal, or jugular veins, which form the upper branches of the sinuses of Cuvier on either side, unite about the second month by a transverse anastomosing branch. The left superior vena cava assumes an oblique position, and empties itself into the lower and left end of the auricle. Finally, its trunk disappears, while its orifice is transformed into the coronary sinus, in which the great cardiac vein opens. The right sinus of Cuvier, or superior vena cava, persists; the transverse anastomosing branch between the two jugulars becomes the left innominate vein, and the end of the right jugular the right innominate. The venous circulation in the lower part of the embryo is at first carried on by the inferior cardinal veins, which return the blood from the Wolffian bodies, and receives branches corresponding to the intercostal, lumbar, and crural veins.

Between the fourth and fifth week, the inferior vena cava begins to appear, in the form of a vessel, which passes upward, behind the liver and between the two Wolffian bodies. It anastomoses below with the two cardinal veins, and with the crural veins, which gradually come to open into it.

The middle part of the cardinal veins disappears; their distal extremities persist as the hypogastric veins, which open along with the crural into the vena cava, forming the iliac and other veins of the lower extremities. The termination of each cardinal vein above, in the sinus of Cuvier, or superior cava, also persists. The central atrophied portion of the cardinal veins is replaced by a vein on either side, called posterior vertebral, which receive the intercostal and

lumbar veins, and are soon united by an oblique anastomosing branch. The right vertebral vein, together with the persistent termination of the right cardinal vein, forms the great azygos vein. The distal portion of the left vertebral vein, with the oblique anastomosing branch, forms the small azygos; and the upper part of the left vertebral, with the persistent termination of the left cardinal, forms the left superior intercostal vein.

PECULIARITIES OF THE FœTAL CIRCULATION.

The chief peculiarities in the heart of the fœtus are the direct communication between the two auricles through the foramen ovale, and the large size of the Eustachian valve. There are also several minor peculiarities. Thus, the position of the heart is vertical until the fourth month, when it commences to assume an oblique direction. Its size is also very considerable, as compared with the body, the proportion at the second month being as 1 to 50; at birth it is as 1 to 120; whilst, in the adult, the average is about 1 to 160. At an early period of fœtal life, the auricular portion of the heart is larger than the ventricular, the right auricle being more capacious than the left; but, toward birth, the ventricular portion becomes the larger. The thickness of both ventricles is, at first, about equal; but, toward birth, the left becomes much the thicker of the two.

The *foramen ovale* is situated at the lower and back part of the septum auricularum, forming a communication between the auricles. It attains its greatest size at the sixth month.

The *Eustachian valve* is developed from the anterior border of the inferior vena cava, at its entrance into the auricle. It is directed upward, on the left side of the opening of this vein, and serves to direct the blood from the inferior vena cava through the foramen ovale into the left auricle.

The peculiarities in the arterial system of the fœtus are the communication between the pulmonary artery and descending part of the arch of the aorta, by means of the *ductus arteriosus*, and the communication between the internal iliac arteries and the placenta, by means of the umbilical arteries.

The *ductus arteriosus* is a short tube, about half an inch in length at birth, and of the diameter of a goose-quill. In the early condition, it forms the continuation of the pulmonary artery, and opens into the arch of the aorta, just below the origin of the left subclavian artery; and so conducts the chief part of the blood from the right ventricle

into the descending aorta. When the branches of the pulmonary artery have become larger relatively to the ductus arteriosus, the latter is chiefly connected to the left pulmonary artery; and the fibrous cord, which is all that remains of the ductus arteriosus in later life, is found to be attached to the root of that vessel.

The *umbilical* or *hypogastric arteries*, arise from the internal iliacs, in addition to the branches given off from those vessels in the adult. Ascending along the sides of the bladder to its fundus, they pass out of the abdomen at the umbilicus, and are continued along the umbilical cord to the placenta, coiling round the umbilical vein. They return to the placenta the blood which has circulated in the system of the foetus.

The peculiarity in the venous system of the foetus is the communication established between the placenta and the liver and portal vein, through the umbilical vein, and with the inferior vena cava by the ductus venosus.

The arterial blood destined for the nutrition of the foetus, is carried from the placenta to the foetus, along the umbilical cord, by the umbilical vein. The umbilical vein enters the abdomen at the umbilicus, and passes upward along the free margin of the suspensory ligament of the liver, to the under surface of that organ, where it gives off two or three branches to the left lobe, one of which is of large size; and others to the lobus quadratus and lobulus Spigelii. At the transverse fissure it divides into two branches; of these, the larger is joined by the portal vein, and enters the right lobe; the smaller branch continues onward, under the name of the ductus venosus, and joins the left hepatic vein at the point of junction of that vessel with the inferior vena cava. The blood, therefore, which traverses the umbilical vein, reaches the inferior cava in three different ways. The greater quantity circulates through the liver with the portal venous blood, before entering the vena cava by the hepatic veins; some enters the liver directly, and is also returned to the inferior cava by the hepatic veins; the smaller quantity passes directly into the vena cava, by the junction of the ductus venosus with the left hepatic vein.

In the inferior cava, the blood carried by the ductus venosus and hepatic veins, becomes mixed with that returning from the lower extremities and viscera of the abdomen. It enters the right auricle, and, guided by the Eustachian valve, passes through the foramen ovale into the left auricle, where it becomes mixed with a small

quantity of blood returned from the lungs by the pulmonary veins. From the left auricle it passes into the left ventricle, and from the left ventricle, into the aorta, from whence it is distributed almost entirely to the head and upper extremities, a small quantity being probably carried into the descending aorta. From the head and upper extremities, the blood is returned by the branches of the superior vena cava to the right auricle, where it becomes mixed with a small portion of the blood from the inferior cava. From the right auricle it descends over the Eustachian valve into the right ventricle; and, from the right ventricle, passes into the pulmonary artery. The lungs of the foetus being solid, and almost impervious, only a small quantity of the blood of the pulmonary artery is distributed to them, by the right and left pulmonary arteries, which is returned by the pulmonary veins to the left auricle; the greater part passes through the ductus arteriosus into the commencement of the descending aorta, where it becomes mixed with a small quantity of blood transmitted by the left ventricle into the aorta. Along this vessel it descends to supply the lower extremities and viscera of the abdomen and pelvis, the chief portion being, however, conveyed by the umbilical arteries to the placenta.

From the preceding account of the circulation of the blood in the foetus, it will be seen :

1. That the placenta serves the double purpose of a respiratory and nutritive organ, receiving the venous blood from the fetus, and returning it again reoxygenated, and charged with additional nutritive material.
2. That nearly the whole of the blood of the umbilical vein traverses the liver before entering the inferior cava; hence the large size of this organ, especially at an early period of foetal life.
3. That the right auricle is the point of meeting of a double current, the blood in the inferior cava being guided by the Eustachian valve into the left auricle, whilst that in the superior cava descends into the right ventricle. At an early period of foetal life, it is highly probable that the two streams are quite distinct; for the inferior cava opens almost directly into the left auricle, and the Eustachian valve would exclude the current along the vein from entering the right ventricle. At a later period, as the separation between the two auricles becomes more distinct, it seems probable that some mixture of the two streams must take place.
4. The blood carried from the placenta to the foetus by the umbil-

ical vein, mixed with the blood from the inferior cava, passes almost directly to the arch of the aorta, and is distributed by the branches of that vessel to the head and upper extremities; hence the large size and perfect development of those parts at birth.

5. The blood contained in the descending aorta, chiefly derived from that which has already circulated through the head and limbs, together with a small quantity from the left ventricle, is distributed to the lower extremities; hence the small size and imperfect development of these parts at birth.

DEVELOPMENT OF THE ALIMENTARY CANAL.

The development of the intestinal cavity is, as we have seen, one of the earliest phenomena of embryonic life. This original intestine is closed at either end, and is at first in free communication with the umbilical vesicle. It is divided into three parts; the anterior or cephalic portion of the primitive intestine; the middle, and the posterior or pelvic. From the first is formed the pharynx and œsophagus; from the second, the stomach, small intestine and large intestine, as far as the upper part of the rectum; from the third, the middle third of the rectum. The buccal cavity on the one hand, and the lower portion of the rectum on the other, are separate productions from the external layer of the blastodermic membrane, and do not communicate with the common cavity till a later period. The permanence of the foetal septum in either case constitutes a well-known deformity—imperforate œsophagus or imperforate rectum, as the case may be. The anal cavity is at first common to the uro-genital, as well as to the digestive organs.

The development of the palate, spoken of above, should be studied in this connection.

The tongue appears about the fifth week, as a small elevation, behind the inferior maxillary arch, to which is united another projection from the second pharyngeal arch. The epithelial layer is furnished by the external blastodermic membrane.

The tonsils appear about the fourth month.

The *middle* portion of the primitive intestine is at first a straight tube, communicating freely with the umbilical vesicle. It then leaves the vertebral column in the middle, and forms a curve attached to that column by the mesentery. A portion of the intestine above this mesentery dilates into the stomach, which gradually also acquires a mesentery of its own; the rest remains attached to the spine, and forms the duodenum. The curve of the intestine appears, as it were,

drawn out from the body by its attachment to the vitelline duct, and lies external to the parietes, and in the umbilical cord, until the end of the third month, when it passes back again into the abdomen. While still forming a portion of the cord, the intestine begins to be distinguished into large and small, for the anterior or upper part, corresponding to the small intestine, begins to assume a convoluted arrangement about the eighth week, whilst the lower part, which had been posterior, passes to the front and right side of the other, and becomes dilated at a short distance from the insertion of the vitelline duct, to form the rudiment of the cæcum. When the intestine lies wholly in the belly, the curve of the large intestine begins rapidly to form; but the cæcum lies for some time in the middle line, and the ascending colon is not fully formed till the sixth month.

The source of each layer of the intestine, and the closure of the omphalo-mesenteric or vitelline duct, have been spoken of.

The *liver* appears after the Wolffian bodies, about the third week, in the form of two depressions, formed by the epithelial and fibro-intestinal layers of the blastodermic membrane, and projecting from the intestine at the part which afterward forms the duodenum. These depressions are developed into the right and left lobes. They grow very rapidly around the omphalo-mesenteric vein, from which they receive the branches enumerated, and about the third month the liver almost fills the abdominal cavity. From this period the relative development of the liver is less active, more especially that of the left lobe, which now becomes smaller than the right; but the liver remains up to the end of foetal life relatively larger than in the adult.

The *gall-bladder* appears about the second month, and bile is detected in the intestine in the third month.

The *pancreas* is also an early formation, being far advanced in the second month. It, as well as the other salivary glands, which appear about the same period, originates in a projection from the epithelial layer, which afterward forms a cavity, from the ramifications of which the lobules of the gland are formed.

DEVELOPMENT OF THE RESPIRATORY ORGANS.

The *lungs* appear somewhat later than the liver. They are developed from a small cul-de-sac, which is formed on either side as a projection from the epithelial and fibrous laminæ of the intestine. During the fourth week these depressions are found on either side, opening freely into the pharynx, and from the original pouches, other secondary pouches are given off, so that by the eighth week the form

of the lobes of the lungs may be made out. The two primary pouches have a common pedicle of communication with the pharynx. This is developed into the trachea, the cartilaginous rings of which are perceptible about the seventh week. The parts which afterward form the larynx are recognized as early as the sixth week, viz., a projection on either side of the pharyngeal opening, the rudiment of the arytenoid cartilages, and a transverse elevation from the third pharyngeal arch, which afterward becomes the epiglottis; the vocal cords and ventricles of the larynx are seen about the fourth month. The traces of the diaphragm appear early, in the form of a fine membrane, separating the lungs from the Wolffian bodies, the stomach and liver, but the source of its formation has not been ascertained. The pleural and peritoneal cavities are then separated, having been common up to this time. The serous membrane of the pleura is formed about the tenth week; but its development is also unknown.

DEVELOPMENT OF THE URINARY ORGANS.

The allantois, as we have seen, communicates at first with the lower part of the primitive intestine by a canal—the urachus. After the second month, the lower part of the urachus dilates, so as to form the bladder, which then communicates above with the cavity of the urachus, and below with the rectum, by a canal of communication, which is afterward transformed into the urethra. The urachus is obliterated before the termination of foetal life; but the cord formed by its obliteration is perceptible throughout life, passing from the upper part of the bladder to the umbilicus.

The *kidneys* are also formed from the lower end of the urachus. They are at first hollow organs, lying behind and below the Wolffian body. As their distance from the bladder increases, by the growth of the foetus, the ureters become developed, and the simple cul-de-sacs in which the foetal kidneys commence, divide and subdivide, so as to form lobulated organs, provided with calices in their interior. This lobulation is perceptible for some time after birth.

The *suprarenal* bodies are formed independently both of the kidneys and Wolffian bodies.

The *Wolffian body*, or primordial kidney, is perceptible about the third week, forming a mass of cells, which soon give rise to a hollow organ, situated on either side of the primitive vertebræ, and extending from the heart to the lower end of the embryo, terminating above in a cul-de-sac, and opening below into the bladder. The structure of the Wolffian body is in many respects analogous to that of the permanent

kidney. It is composed partly of an excretory canal, into which open numerous "conduits," rectilinear at first, but afterward tortuous, and partly of a cellular or glandular structure, in which Malpighian tufts are found. It is fixed to the diaphragm by a superior ligament, and to the spinal column by an inferior or lumbar ligament. Its office is the same as that of the kidneys, viz., to secrete fluid containing urea, which accumulates in the bladder. When the permanent kidneys are formed, the greater part of the Wolffian body disappears. The rest takes part in the formation of the genital organs.

DEVELOPMENT OF THE GENITAL ORGANS

The *internal genital organs* have at first no distinctive signs of sex. They are developed from the Wolffian body, the genital gland, and the conduit of Muller. The genital glands are masses of cells, which are formed toward the sixth week of foetal life. They are produced from the middle blastodermic layer, and lie on the inside of the Wolffian body, to which they are attached by a mesenteric layer of peritoneum. The conduit of Muller, or genital duct, is formed at the same time as the genital gland, and like it, from the middle blastodermic layer. It is at first a mere cellular cord, and then represents a canal, the upper part of which is closed; the lower opens into the bladder. It lies internal and anterior to the duct of the Wolffian body.

Up to this point, no difference of sex is perceptible; but from this stage, toward the commencement of the third month, the internal organs of the female and male begin to assume a different appearance.

Female Organs.—The genital gland, in its development into an ovary, becomes more lengthened, and assumes an oblique position, by which characters it can be distinguished from the testicle, about the ninth or tenth week. The ovary is at first situated internal and anterior to the Wolffian body. As that body disappears, the ovary descends toward the inguinal region. It passes into the pelvis toward the end of foetal life. The ovules and Graafian follicles are derived from the genital gland, but according to His, the stroma of the ovary is furnished by the Wolffian body.

The Fallopian tube is formed by the portion of the duct of Muller, which lies above the lumbar ligament of the Wolffian body. This duct is at first completely closed, and its closed extremity remains permanent, forming a small cystic body, attached to the fimbriated end of the Fallopian tube, and called the "hydatid of Morgagni."

Below this, a cleft forms in the duct, and is developed into the fimbriated opening of the Fallopian tube.

Below this portion of the duct of Muller, that body on either side and the ducts of the Wolffian body, are united together in a structure called "the genital cord," in which the two Mullerian ducts approach each other, lying side by side, and finally coalescing, to form the cavity of the vagina and uterus. This coalescence commences in the middle, corresponding to the body of the uterus. The upper parts of the Mullerian ducts in the genital cord constitute the cornua of the uterus, little developed in the human species. The only remains of the Wolffian body consist in a structure (parovarium, or organ of Rosenmuller), which can usually be detected lying between the ovary and Fallopian tube, and consisting of a group of tubules converging to a single duct, which is sometimes of considerable size, and runs for some distance in the broad ligament.

About the fifth month, an annular constriction marks the position of the neck of the uterus, and after the sixth month, the walls of the uterus begin to thicken.

The round ligament is derived from the lumbar ligament of the Wolffian body, the superior ligament of the genital gland becomes the cord which attaches the ovary to the fimbriated extremity of the Fallopian tube, the peritoneum constitutes the broad ligaments, the superior ligament of the Wolffian body disappears with that structure.

Internal Organs in the Male.—1. The genital gland, in its development into a testicle, becomes rounded and thick, and is more vertical than the ovary is in its early state. The tubuli seminiferi are early visible, being at first short and straight, and then gradually assume a coiled arrangement. The tunica albuginea is formed about the third month.

2. The Mullerian ducts disappear in the male sex, with the exception of their lower ends. These unite in the middle line, and open by a common orifice into the uro-genital sinus. This constitutes the *utriculus hominis* or *sinus prostaticus*.

3. The head of the epididymis, its canal, the vas deferens, and ejaculatory duct, are formed from the canals, and from the duct of the Wolffian body.

The remains of the Wolffian bodies also form the vas aberrans, and a structure described by Giraldes, and called after him, "the organ of Giraldes," which bears a good deal of resemblance to the organ of Rosenmuller in the other sex. It consists of a number of convoluted

tubules lying in the cellular tissue in front of the cord, and close to the head of the epididymis.

The descent of the testis and the formation of the gubernaculum will be described under congenital hernia.

The *external organs of generation*, like the internal, pass through a stage in which there is no distinction of sex. We must, therefore, first describe this stage, and then follow the development of the female and male organs respectively.

As stated above, the anal depression at an early period is formed by an involution of the external epithelium, apart from the intestine, which is still closed at its lower end. When the septum between the two opens, which is about the fourth week, the urachus in front and the intestine behind both communicate with the *cloaca*. About the second month, a transverse division (the *perineum*), begins to form, and divides the cloaca into the anal cavity behind, the *urogenital sinus* in front. In the sixth week, a tubercle, the *genital tubercle*, is formed in front of the cloaca, and this is soon surrounded by two folds of skin, the *genital folds*. Toward the end of the second month, the tubercle presents, on its lower aspect, a groove, the *genital furrow*, turned toward the cloaca. All these parts are well developed at this period, when the anus is separated from the urogenital sinus, yet no distinction of sex is possible.

The female organs are normally developed by an easy transition from the above form. The urogenital sinus persists as the vestibule of the vagina, and forms a single tube with the upper part of the vagina, which we have already seen developed from the united Müllerian ducts. The genital tubercle forms the clitoris, the genital folds the labia majora, the lips of the genital furrow, the labia minora, the genital furrow remaining open, except below where it unites with the perineum, constituting the raphe.

In the male, the changes are normally greater, from the different type. The genital tubercle is developed into the penis, the glans appearing in the third month, the prepuce and corpora cavernosa in the fourth. The genital furrow closes, and thus forms a canal, the spongy portion of the urethra. The urogenital sinus becomes elongated, and forms the prostatic and membranous urethra. The genital folds unite in the middle line, to form the scrotum, at about the same time as the genital furrow closes, viz., between the third and fourth month.

ORDER OF THE DEVELOPMENT OF THE FÖTUS.

The following, from the work of Baunis and Bouchard, by Gray, will serve to present a *resume* of the facts of fœtal development, in an easily accessible form :

End of Second Week.—Formation of the amnion and umbilical vesicle. Chorda dorsalis and medullary groove. Heart.

Beginning of Third Week.—The vitelline membrane has entirely disappeared. Protovertebral disks. First pharyngeal arch. Buccal depression. Primitive circulation.

End of Third Week.—The allantois and Wolffian body appear. The amnion is closed. Cerebral vesicles. Primitive ocular and auditory vesicles. Coalescence of the inferior maxillary protuberances. Liver. Formation of the three last pharyngeal arches.

Fourth Week.—The umbilical vesicle has attained its full development. Projection of the caudal extremity. Projection of the upper and lower limbs. Cloacal aperture. The heart separates into a right and left heart. Spinal ganglia and anterior roots. Olfactory fossæ. Lungs. Pancreas.

Fifth Week.—Vascularity of the allantois in its whole extent. First trace of hands and feet. The primitive aorta divides into primitive aorta and pulmonary artery. Conduit of Muller and genital gland. Ossification of clavicle and lower jaw. Cartilage of Meckel.

Sixth Week.—The activity of the umbilical vesicle ceases. The pharyngeal clefts disappear. The vertebral column, primitive cranium, and ribs assume the cartilaginous condition. Posterior roots of the nerves. Membranes of the nervous centres. Bladder. Kidneys. Tongue. Larynx. Thyroid gland. Germs of teeth. Genital tubercle and folds.

Seventh Week.—The muscles begin to be perceptible. Points of ossification of the ribs, scapula, shafts of humerus, femur, tibia, intermaxillary bone, palate, upper jaw (its first four points).

Eighth Week.—Distinction of arm and forearm, and of thigh and leg. Appearance of the interdigital clefts. Capsule of the lens and pupillary membrane. Completion of the interventricular and commencement of the interauricular septum. Salivary glands. Spleen. Suprarenal capsules. The larynx begins to become cartilaginous. All the vertebral bodies are cartilaginous. Points of ossification of the ulna, radius, fibula and ilium. The two halves of the bony palate unite. Sympathetic nerve.

Ninth Week.—Corpus striatum. Pericardium. Distinction between ovary and testicle. Formation of the genital furrow. Osseous nuclei of vertebral bodies and arches, frontal, vomer, malar bone, shafts of metacarpal bone, metatarsal bones and phalanges. The union of the hard palate is completed. Gall-bladder.

Third Month.—Formation of the foetal placenta. The projection of the caudal extremity disappears. It is possible to distinguish the male and female organs at the commencement of the third month.

The cloacal aperture divided into two parts. The cartilaginous arches on the dorsal region of the spine close. Points of ossification for the occipital, sphenoid, os unguis, nasal bones, squamous portion of temporal and ischium. Orbital center of superior maxillary bone. Commencement of formation of maxillary sinus. Pons varolii. Fissure of Sylvius. Formation of eyelids, and of hairs and nails. Mammary gland. Epiglottis. Union of the testicle with the canals of the Wolffian body. Prostate.

Fourth Month.—The closure of the cartilaginous arches of the spine is complete. Osseous points for the first sacral vertebra and pubes. Ossification of the malleus and incus. Corpus callosum. Membranous lamina spiralis; cartilage of the Eustachian tube. Tympanic ring. Fat in subcutaneous cellular tissue. Tonsils. Closure of genital furrow and formation of scrotum and prepuce.

Fifth Month.—The two layers of decidua begin to coalesce. Osseous nuclei of axis and odontoid process. Lateral points of first sacral vertebra; median points of second. Osseous points of lateral masses of ethmoid. Ossification of stapes and petrous bone. Ossification of germs of teeth. Appearance of germs of permanent teeth. Eruption of hair on head. Sudoriferous glands. Glands of Brunner. Follicles of tonsils and base of tongue. Lymphatic glands. Commencement of limitation of uterus and vagina.

Sixth Month.—Points of ossification for the anterior root of the transverse process of the seventh cervical vertebra. Lateral points of second sacral vertebra; median points of third. The sacro-vertebral angle forms. Osseous points of the manubrium sterni and of the os calcis. The cerebral hemisphere covers the cerebellum. Papillæ of the skin. Sebaceous glands. The free border of the nail projects from the corium of the dermis. Peyer's patches. The walls of the uterus thicken.

Seventh Month.—Additional points of first sacral vertebra; lateral points of third; median point of fourth. First osseous point of body of sternum. Osseous point for astragalus. Disappearance of Meckel's cartilage. Cerebral convolutions. Insula of Reil. Separation of tubercula quadrigemina. Disappearance of pupillary membrane. The testicle passes into the vaginal process of the peritoneum.

Eighth Month.—Additional points for the second sacral vertebra; lateral points for the fourth; median points for the fifth.

Ninth Month.—Additional points for the third sacral vertebra; lateral points for the fifth. Osseous point for the middle turbinated bone; for the body and great cornu of the hyoid; for the second and third pieces of the body of the sternum; for the lower end of the femur. Ossification of the bony lamina spiralis and axis of the cochlea. Opening of the eyelids. The testicles are in the scrotum.

Fœtal life terminates.

DISEASES OF THE FœTUS.

No work on diseases of infants is at all complete or satisfactory that omits the diseases incident to ante-natal life. We are indebted to Copeland, Hamilton, and others for the facts here presented.

The *fœtus* is liable to a greater number of diseases than has generally been supposed. As these diseases occasion various malformations, congenital alterations, abortions, or even the death of the *fœtus*, a brief enumeration of them will be useful in various points of view, but particularly as indicative of the sources in which several maladies of infancy originate.

The causes of *fœtal* disease are as respects the *mother*, violent or prolonged mental emotions; imperfect or unwholesome nourishment; excessive fulness or deficiency of blood; a morbid state of this fluid, produced by food, medicines, or disease; alteratives, as *Mercury*, etc., in large doses, or too long continued; attempts at procuring abortion; the use of straight corsets; injuries, falls, or blows on the abdomen; a cachectic state of constitution, particularly the syphilitic and serofulvous taints; constitutional or other diseases, as eruptive, periodic, or continued fevers; tubercular consumption, etc.; drunkenness and venereal excesses during pregnancy; a laborious life, or inordinate physical exertion, and previous lesions of the ovaries, uterus, or *fœtal* appendages.

The chief causes, as respects the father, are predisposing only, with the exception of the syphilitic and serofulvous taints. There is every reason to believe that if the father is aged, or debilitated, or suffering from constitutional or local disorder, associated with sexual exhaustion, at the period when impregnation is effected, the *fœtus* will be weakly formed, and thereby predisposed to disease, especially when the mother is exposed, during utero-gestation, to the more energetic causes, or to those just enumerated.

The diseases observed in the *fœtus*, either consequent upon one or more of the above causes, or recurring without any assignable cause, are :

1. *Cerebro-Spinal System*.—Effusions of fluid in the ventricles, or in the spinal canal, or between the membranes, giving rise to hydro-

cephalus, spina bifida, imperfect or arrested formation of portions of the brain or spinal cord, to inflammatory congestion of the membranes, or of portions of the brain or cerebellum (Lobstein), with spasmodic contractions of the limbs, etc.

2. *Thoracic Viscera*.—Inflammation and suppuration of the thymus-gland (Veron); tubercles in the lungs in the early stages (Billard, Langstaff and Copeland); and in a state of softening (Husson); inflammation of the substance of the lungs and of the pleura; dropsy of the pleural cavities; hydro-pericardium, and malformations of the heart.

3. *Abdominal Viscera*.—Inflammation, and even ulceration of the internal surface of various parts of the alimentary canal; tubercles in the liver (Hoogeveen, Husson), in the mesentery (Oerler), and in the spleen (Billard); inflammations of the liver (Brachet, Veron); of one supra-renal capsule (Andral), of the peritoneum (Desormeaux, Veron), of the small intestines (Billard); dropsy of the peritoneal cavity in various degrees (Duges); enlargement of the mesenteric glands; adhesions of the peritoneum, and of several viscera, from chronic inflammation (Andry and Billard); retention of urine, and excessive distension of the bladder, uterus, and pelvis of the kidneys, from obstructions to the discharge of it in the liquor amnii (Sandifort, Moreau, Pii. Pinel, A. Cooper, Chaussier, Duges, etc.); rupture of the bladder (Duges); lesions of the kidneys, and other parts of the urinary apparatus (Ruysch, Hoffmann, Wrisberg, Vrolik, Boetschler, Denis, Boivin, etc.); and obliterations of canals, and occlusions of their outlets, as of those of the alimentary canal, and of the urinary and generative organs.

4. *General Frame*.—Intermittent fevers, small-pox (Deuttel, etc.), and other eruptive fevers (Andry); syphilis and jaundice (Hey, Andry, Baumes, etc.).

5. *External Parts*.—Malformation of the palate, mouth, and lips; dislocation of various joints, and even of the hip-joint (Dupuytren, Chaussier, North); contractions of muscles; fractures, gangrene, etc., of the limbs (Joerg); hardening of the cellular tissue (Uzembbezins, Mauriceau, Stratford, etc.); anasarca and œdema of one or more limbs (Gardien, Duges, Andry, etc.); hydrocele (Andry); various tumors and nævi; and several affections of the skin (Goeckel, Ledel, Oehler, Chaussier, Andry, etc.)

Mauriceau was born with the small-pox. Jaundice may arise in the fœtus, first, from the same causes as induce it in the adult; and,

second, from jaundice in the mother. M. Duges mentions that a lady was subject, during pregnancy, to colic and jaundice, from biliary calculi, and, in four instances, the children were born deeply jaundiced. Copeland attended a lady in tubercular consumption, who was delivered, in the seventh month, of an emaciated and very small fœtus, that died a few days afterward. On examination, the lungs were found loaded with tubercles, and the mesenteric glands enlarged. M. Tonnelé found an enormous fungoid tumor (*fungus hæmatodes*) on the right side of the head of a fœtus; and M. Voisin, a polypus adhering to the posterior part of the palate. The existence of worms in the bowels of the fœtus has been asserted by some writers, and denied by others. The evidence is not sufficiently conclusive, either one way or another.

The *death of the fœtus* may take place from the greater number of these diseases, or from lesions of the placenta, umbilical cord, or membranes. Although there are numerous exceptions to the rule, the more vigorous the fœtus, the stronger and more lively will be the sensations of its movement. It is evident that the existence, and far less the nature of the foetal malady, cannot be ascertained before delivery; yet, in some instances, it may be suspected from what is known of the causes. An attack of ague in the fœtus is usually made manifest to the mother, but does not generally cause abortion. The feebleness and slowness of the foetal movements after the fifth month, are indications of impaired strength of the fœtus, which should not be overlooked. The total cessation of motion; a feeling of uncomfortable weight, gravitating to the side on which the patient lies, and of general uneasiness and coldness in the lower part of the abdomen; flaccidity of the abdominal parietes, subsequent to a certain degree of tension; fœtor of the breath; pallor of the countenance; lividity of the eyelids, or surrounding circle, and flaccidity of the breasts, generally denote the death of the fœtus; and when the pulsation of the heart cannot be heard on auscultation, this event may be inferred with certainty.

CONGENITAL AFFECTIONS.**CONGENITAL DISEASES OF THE SKIN.**

Petechiae have been noticed by Andral, (Anat. Path., vol. ii., p. 417), Cruvelhier (Anat. Path., liv., xv.), and Andry.

Ichthyosis is often transmitted to the offspring, as related by Martin (Philos. Trans., vol. xl ix., p. 21), where six children were similarly affected, the celebrated "Porcupine family." A fœtus affected with this disease is in the Anatomical Museum at Berlin (Steinhausen, De Sing. epiderm. Deformatione, *Berlin Medical Gazette*, 1831, vol. ii., p. 10). For an analysis of Schmidt's "*Descriptio Ichthyosis Cornea Congenitæ in virgine Observatæ*," see *American Journal Medical Sciences*, November, 1831.

Pemphigus.—A case of congenital pemphigus is related by Lobstein (Journ. Comp. du Dict. des. Sc. Med., vol. vi.); several, also, by Hintz (Bull. des Sci. Med. de Ferussac, xi., 47), Goeckel, Sedd (Eph. Cur. Nat.), and Desormeaux (Art. Œuf Humain, Dict. de Med., 1st edition, Andry). For a very remarkable case, attended with pustules and scrofulous tumors, see Rec. per. d'Obs. de Ch. Med. et Pharm., 1756, vol. i., p. 167.

Syphilis.—This disease is often found to affect the new-born child. We have seen several well-marked cases; and Dr. Froncis (Med. and Phil. Reg.), has also recorded several. Cases have often been recorded in our medical journals; and cases 7, 9, 10, 11, and 12, in Cruvelhier's liv. xv., are those of syphilitic phlyctenæ and pustules. Mr. Hey, of Leeds, has written a valuable paper on the venereal disease in the fœtus in utero (Med. Ch. Trans., vol. vii.); and so, also, has Bertin (Treat. on the Venereal Disease in New-born Children, Pregnant Women, and Nurses, Paris, 1810). For several cases, see Beck's "Med. Juris," and American edition of Guy's "Forensic Medicine."

Variola has been frequently observed in the new-born fœtus; cases are related by Bayer, Marc (Dict. des Sci. Med., vol. xvi., p. 71, three cases); Jenner, (Medical Chir. Trans. vol. i., p. 269); Deneaux (Journ. Heb., vol. viii., second series, p. 56); Husson, (Rev. Med., vol. xi., p. 151); Noblet (Arch. Gen. de Med., vol. xii., p. 126); and the

celebrated Mariceau is said to have been born with five or six distinct pustules. Davis (Princ. and Pract. of Obst. Med., 1834, p. 891) has referred to cases by Smellie, Mauriceau, Blaud, J. Hunter, Baker, and Roberts. See a paper (Med. Comm., 1799), by Dr. Pearson, on "The Effects of Variolous Infection on Pregnant Women," in which several instances of this affection are recorded; also, Watson, in Philosoph. Transact., vol. xlvi., p. 235; and Billard on "Diseases of Infants," (Stewart's Translation, 1842).

Rubeola has been observed at birth, according to Vogel, Rosen, (Dis. of Children, 1 xiv., p. 255), and Billard (Dis. of Inf.)

For a case in which congenital *vaccine tubercles* were observed on the arm, see *Med. Chir. Rev.*, Jan. 1830.

Dr. Warren relates an instance (Am. Journ. Med. Sci., Feb. 1828), where a foetus was poisoned by *Opium* taken by the mother.

Elephantiasis was observed twice, in the lower limbs, by M. Chaussier, at the Maternite, in Paris, out of 23,000 children born there. Alard has also recorded instances.

Sclerema, or hardening of the cellular tissue, is a frequent disease in new-born children in Paris. Andry states that 600 children died of it annually at the Hospice des Enfans Trouves; and Billard observes that 240 were admitted with it, in one year, into the same hospital. According to the latter writer, there are two varieties of the disease, the *œdematosa* and *concreta*, and both arise from an accumulation of a highly coagulable serum in the subcutaneous, adipose, and intermuscular cellular tissue. See *Mem. de la Soc. Roy. de Med.*, 1784; Underwood on Diseases of Children; works of Matthew Baillie, and *Boston Medical and Surgical Journal* for 1829 (case by Dr. Stratford). Lee observed this affection in several instances, chiefly in the offspring of intemperate mothers. Cases in the Chicago Foundlings' Home, where children were severely chilled from early exposure.

Erysipelas, according to Good, has, in some instances, been observed in new-born children (Study of Med., vol. ii., p. 260.)

Icterus is not an unfrequent occurrence in the foetus, though it is not certain that the yellowness depends on the presence of bile, though the experiments of M. Chevreul render it probable. See Andral (Anat. Path., West's translation, vol. i., p. 583); Lobestein (Rep. d'Anat. Path., vol. i.), and Ollivier (On the Spinal Marrow, etc., vol. i. p. 209, 2d ed.); also Morgagni (Cooke's trans., vol. ii., p. 176). Desormeaux, Billard, and Andry, have likewise recorded instances of this affection.

Congenital Absence of the Skin has been noticed by Rayer, Plouquet, Joerg, (Bib. Med.), and others. Naegle relates a remarkable instance, where the epidermis all peeled off from a new-born child (*Journ. des Progres, Andry*). Dr. Potter, of Maquon, reports a similar case. He supposed the liquor amnii had scalded it off, as that fluid was unusually hot. (*Medical Investigator*, vol. xi., p. 142). Rayer has recorded a case of congenital development of the papillæ (*Mal de la Peau*, vol. iii., p. 613).

Leucopathia, or absence of coloring matter in the skin, hair, and eyes, is sometimes congenital; and Pritchard relates a case, from Buckingham's Travels, where a perfectly black offspring was born to white parents, in the valley of the Jordan (*Nat. Hist. of Man*).

Several writers mention the existence of *congenital warts*, as M. Ollivier d'Angers (*Arch. Gen. de Med.*, vol. xxxv., p. 74); A. T. Thompson (*Atlas of Delineations of Cutaneous Diseases*, p. 100); Otto (*Path. Anat.*, p. 113, note 5); Lobstein, Billard, and others. For a remarkable paper on *naevi*, or "*telangiectasis*," by John Watson, of New York, see *American Journal of Medical Sciences*, May, 1839. See also MM. Alibert and Rayer, "On Diseases of the Skin," and M. Tarrall, in *Arch. Gen. de Med.*, September and October, 1834.

Cases are on record of the congenital *absence of the hair and nails* (Rayer, Otto, p. 118).

Congenital deafness is too well known to need particular description. For an account of three cases, with dissection, where it arose from malformation, the reader may consult *Medico Chirurgical Review* for January, 1836. See, also, London *Medical Gazette* February, 1840, p. 793, and Graefe and Walther's *Jour. fur Chirurg.*, xix., 1.

Congenital Malformations of the Eyes are by no means unfrequent. For a very full account of them, see Otto's *Path. Anat.*, by South, and a work "On the Original Malformation and Total Want of Eyes in Man and the Lower Animals," by B. W. Seiler, Dresden, 1834, and an analytic review of the same, in *Medico Chirurgical Review* for April, 1834. For cases of congenital tumors growing on the cornea, see Wardrop (On Dis. of the Eye), and Middlemore in *Medico Chirurgical Review*. Telangiectasis of this membrane is mentioned by Graefe; congenital staphyloma of the cornea, cataract, and amaurosis, by most writers on diseases of the eye. A case of congenital leucoma is recorded by Kiesir (Himley and Schmidt's *Oph. Bib.*, vol. iii.); of arcus senilis, by Morenheim; and Andry (*Journ. des Prog.*, vol. i., 1830, p. 195), gives an account of a case of complete obscuration of

the cornea of both eyes in a new-born child, the cornea being of a pearly-white color.

Congenital Nasal Polypus has been noticed by Andry, and a case is mentioned in the Catalogue of Sœmmering's Mus., p. 87, as deposited in that museum at Berlin.

There may be either an *imperfect development of the mouth* (atelostomia) or an entire absence (astomia). Of the former, see a case by M. Littré (in Mem. de l'Arcad. Roy des Sci., 1701).

Congenital harelip is too well known to need remark. In some cases (Meckel) the lower lip is divided instead of the upper (see Billard).

Cases of Muguet (aphtha) in the new-born child, have been related by M. Veron, and described by Cruvelhier (Anat. Path. 15 livraison).

For cases of *torticollis*, and other congenital deformities of the muscular system, see Dict. des. Sci. Med., vol. xxxiv., p. 182.

A case of *deficiency of the abdominal parietes* in an infant, is related by Dr. Montgomery, in Dublin Med. Trans., n. s., vol. i., 1830; also by Millet, in Vondermonde's Journal, May, 1756, where the contents of the abdomen had passed out of a round hole in the umbilical region. See a case by Dr. Campbell in *American Journal of Medical Sciences* for November, 1836; and one by Dr. Currell, in *Ibid.*, 1838, and a note to American edition of Gooch's Lectures on Midwifery, p. 282, by the editor. Similar cases are related in *American Journal of Medical Sciences* for February, 1833, p. 436, and for November, 1838, p. 192.

CONGENITAL AFFECTIONS OF THE SKELETON.

Meckel has described these, Man. of Gen. and Descr. Anat., (Doane's ed., vol. i.), to consist in: (1), Congenital deficiency of the cartilages of the ribs; (2), Deficiency of vertebræ, or of some parts of them, as in *spina bifida*; (3), Absence of sternum; (4), Openings, at the lower part of the body, of the bone, or in the xiphoid appendage, or fissure of that appendage; (5), Deficiency of the usual number of ribs, shortness, consolidation, anomalous curves, or supernumerary ribs; (6), The congenital condition of the bones of the head and face, in *acephalia*, *encephalocele*, *hydrocephalus*, and *harelip*; (7) Deficiency of the humerus, or one or both bones of the fore-arm; (8), Total or partial deficiency of the bones of the hand; increased number of the same; fusion of one or more bones of the fingers; (9), Loose connection of the os pubis; (10), Total or partial deficiency of the bones of the thigh, or one or both bones of the leg. (See Otto's Path. Anat.).

A case of extreme smallness of the head is recorded by Cruveilhier (Anat. Path.), and others.

Congenital lateral depression of the chest, by Dupuytren (Rep. d'Anat., vol. v.), and by Billard (On Infants).

Mollities ossium has been noticed in the foetus, by Soemmering (Catal. mus., p. 75); by Pinel (Medecine Eclairee par les Sci. Phys., vol. i., p. 3); by Chaussier and by Bourgenaud (Ann. de la Soc. Med. de Montpellier, vol. i., pl. i., p. 182).

A case of congenital gibbosity of the pelvis is mentioned in Velpeau's Tokology, and one also in Baudelocque.

A well-marked case of *fungus hæmatodes* in a new-born foetus is related by Dr. Tonnelé (Journ. des Prog., vol. xiv.; Med. Chirurg. Rev., October, 1829). For a similar case of *fungus hæmatodes*, in a child seven weeks old, see the same journal, for January, 1834.

Tumors of various kinds, as purulent, bloody, lardaceous, encysted, steatomatosus, etc., have likewise been observed upon children at birth. Caesar Hawkins has published in the *Med. Chirurg. Trans.* 1839, vol. xxii., a valuable paper on a "Peculiar Form of Congenital Tumors of the Neck," which contains all that is known on this subject. See, also, Otto, Path. Anat., p. 173, 198, 370, (South's Trans).

Cases of congenital spontaneous fractures in the foetus may be found in the Dict. des Sci. Med., art. "Maladies du Fœtus," p. 62. For a case in which 113 fractures were discovered, seventy being of the ribs, see *Bull. de la Fac.*, No. 3, 1813. A case of fracture in the clavicle of the foetus, caused by the mother striking herself against a table when seven months pregnant, is recorded in the same work, 1825, p. 178. Cases of spontaneous fracture are also related in *Journal des Prog.*, vol. vii., p. 247; *Nouv. Obis. sur la Prat. des Acouch.* (Andry) Suite des Conj. Phys., 1708; and Blundell (Midwifery) gives a case where there were four fractures in one foetus.

In this connection, we extract from Hamilton's work on Fractures and Dislocations, p. 31, the following interesting cases:

"Lawrence Proudfoot, of New York (New York Journ. Med., Sept. 1846, p. 199), has related a case of compound fracture in utero, occurring in the practice of Dr. Freeman, which was apparently caused by external violence. Mrs. F., aged thirty-eight, always having enjoyed good health, during the sixth month of gestation, while attempting to pass through a very narrow passage, was severely pressed upon the abdomen, and immediately experienced a severe pain in that region, accompanied with nausea and faintness. The following day, uterine haemorrhage, with pain, commenced; and these symptoms continued

at intervals, in a form more or less severe, up to the period of the delivery, which occurred at full time, and was perfectly natural. At birth, the right foot of the child, a female, was found to be much distorted, and in a condition of valgus with equinus, the outer side of the foot being laid against the side of the leg, above the external malleolus. The tibia, also, of the same limb, near its middle, seemed to have been the seat of a compound fracture; the two ends of the bone having united at an angle slightly salient anteriorly, and the skin presenting over the point of fracture an old cicatrix. The soft tissues adjacent were considerably thickened. Seventeen months after birth, when the child was seen by Drs. Proudfoot, Van Buren, and Isaacs, of New York, the foot, although much improved by the means employed by Dr. Freeman, was still considerably deformed, in consequence of the contraction of the tendo-Achillis; on cutting which, the limb was found to be of the same length with the other.

"Dr. Aristide Rodrigue, of Hollidaysburg, Pa., (*Am. Journ. Med. Sci.*, Jan. 1854, p. 272), has communicated a case of fracture, with dislocation, which he ascribes to a similar cause. The woman, when about four months with child, fell on her left side, striking upon a board, and hurting herself severely. At the full period she was delivered of a well-grown male child. Its left humerus was found to be dislocated into the axilla, and both the radius and ulna of the same limb had been broken through their lower thirds, but were now united by bony callus at an angle of about 45° , and slightly overlapped. In all other respects the child was perfect. It does not appear that anything was done to the fracture, and the attempt to reduce the humerus was unsuccessful. Four years later, Dr. R. saw the lad, and found him strong and hearty, the dislocated humerus having grown nearly at the same rate with the opposite, but the forearm remained 'short and deformed as at birth.' The hand was of the same size of the hand of the sound limb.

"Devergie has given an account of a woman, who, when seven months with child, struck her abdomen against the corner of a table. Intense pain followed, lasting some time. She went her full period, however, and the child was then found to have a fracture of the left clavicle, the fragments being overlapped somewhat, and united in this position by a firm and large callus (*Rev. Med.* 1825). A woman also six months gone, met with a similar accident, and at the full time she gave birth to a feeble child, having in one leg a separation of the shaft of the tibia from its lower epiphysis. The end of the shaft was necrosed, and projected through a wound in the integument. The child died on the thirteenth day.

"Schubert reports the case of a female delivered before her term, of twins, one of whom was born with a fracture of the left thigh, which had occurred in utero; the fractured bone had pierced the flesh, through which it projected more than an inch, and it was carious. The mother stated that about six weeks before the accouchment, during a movement of the foetus, she had heard a noise like that

produced by breaking a stick, and from that moment she had felt pricking pains in her belly. It is probable that in this instance, the fracture was the result of a muscular action, although it is possible that it was occasioned by the thigh having become entangled between the legs of the twin. Similar cases have been recorded by Ploucquet, Kopp, Devergie, Carus, Schubert, Sachse, Moffat, and Brodhurst.

"In many other examples upon record, the explanation is plainly enough to be sought for in the abnormal or rachitic condition of the bones. Monteggie saw, in a newly-born infant, twelve ununited fractures. Chaussier, who has published a memoir upon this subject, mentions two very extraordinary cases, in one of which the child presented forty-three fractures, and in the other, one hundred and twelve. (*Bullet. de la Faculte de Med. de Paris*, 1813, p. 301). I, myself, was permitted to see, on the 29th of June, 1853, with Drs. Hawley and White, of Buffalo, an infant only four days old, who was born at the full time, of a healthy mother, in whom nearly all of the long bones were separated and movable at their epiphyses, the motion being generally accompanied with a distinct crepitus. The bones were also much enlarged in their circumference; the bones of the forearm and the femur were greatly curved; the fontanelles unusually open, and the clavicles were entirely wanting. The child was of full size, but looked feeble. It died in a condition of marasmus, six months after birth: at which time some degree of union had taken place at several of the points of separation, the limbs having been supported constantly with pasteboard splints and rollers.

"I have also seen one example of complete separation of the tibia and fibula, near the middle of the leg, which I was disposed to regard as defective development rather than as an instance of intra-uterine fracture; and a gentleman in Michigan has sent me an account of another, which I am inclined to think belongs to the same class of deformities, although he thought it might be a case of intra-uterine fracture."

Billard relates an instance of a congenital *false joint* (On Infants, obs. 85)

Cases of *luxation* have been described by Hippocrates as occurring to the foetus in utero; and Chaussier has related an instance (*Dict. des Sci. Med.*, art. "Fœtus"), where both thighs, both knees, both feet, and three fingers of the left hand were luxated. Cases are also reported in *Medical Gazette* for 1835; Breschet's Rep. Gen. d'Anat., vol. i., p. 110; also by M. M. Gerdy (in his Report, Lyons, 1820), and by Ballard and Cruveilhier.

Hamilton reports cases of luxation of the jaw, spine, pelvis, sternum, clavicle, and shoulder, as well as of the extremities.

Congenital shortening of the arm has been noticed by Ollivier (*Moelle Ep.*, vol. i., 2d ed., p. 51), Otto, and Meckel; and Duges in *Med. Ep.*

of Montpelier, July, 1826, has published a paper on congenital palsy.

Spontaneous amputation of the limbs of the foetus in utero is a phenomenon occasionally met with in practice; and it has been very ably treated of by Dr. Montgomery, in *Dublin Journal Medical Science*, vols. i. and ii., 1832, and in his work on *Pregnancy*; also by Dr. Simpson, in *Dublin Journ.*, Nov. 1836, vol. x., p. 220. There is a case related by Vassal in the *Gazette Medicale*, 1835, where a foetus was born with only one arm, the scapulo-humeral articulation being covered with a circular cicatrix. The humerus, radius, and ulna, were found in the patient's bed. A similar case is related by Dr. Fitch, in the *American Journal Medical Science*, for May, 1836. In this instance, the foot came away on the 17th of March, and the foetus on the 5th of April following, when the stump was found perfectly healed. Similar cases are related by Chaussier (*Dict. des Sci. Med.*), and by Billard, (*Arch. Gen de Med.*), and by Andry. See, also, St. Hilaire's work on *Monstrosities*; Gardier, in *Journ. des Acc.*, vol. ii., p. 173; Newnham, in *Medical Repository*, vol. iii.; Siebold's *Journal*, vol. xvi.; No. ii.; *American Journal Medical Science*, Aug. 1839; *Arch. de Med.*, vol. xvi., p. 444.

Dr. Ludlam reported an interesting case of amputation of both extremities. (*Medical Investigator.*, p. 110, Vol III., 1865.)

The author met a case of amputation of right leg at lower third.

The congenital deformity of *club-foot*, with its three varieties, varus, vulgus, and equinus, will be found fully described elsewhere. See also modern works on surgery, and earlier writers, Little, Stromeyer, Detmold, Mutter, and Bouvier (in *Mem. de l'Acad. Roy de Medecin*, Paris, 1838). See, also, Cruveilhier, liv. ii., and *Med. Chir. Trans.*, vol. ix., pl. ii., p. 433.

CONGENITAL AFFECTIONS OF THE INTERNAL ORGANS.

Encephalocele, or tumor of the head, has occurred in two instances in the practice of Lee; cases also are related by Billard (79th Obs., 1st ed.), and by Chaussier. An instance is recorded in *Am. Journ. Med. Sci.*, vol. iv., of parencephalocele upon the occiput.

Congenital hydrocephalus is of too frequent occurrence to need remark, as cases of it have occurred within the observation of most practitioners. Lachapelle and Duges, however, state that they met with it only fifteen times in 43,555 labours. See Breschet, in *Dict. de Medecine*, 2d ed.; Gœlis on *Hydrocephalus*; Ramsbotham's *Prac. Obs. on Midwifery*; Cruveilhier's *Path. Anat.*, liv. xv.; Houston, in *Dublin Hospital Reports*, vol. v., p. 327; Otto's *Path. Anat.*, p. 378; and most modern authors on obstetrics.

The apoplexy of new-born children has been ably treated of in Dict. de Med., 2d ed., and well illustrated by Cruveilhier, in Anat. Path., liv. 15, 16, 17. According to this able pathologist, one-third of those who perish in the progress of labor die of apoplexy, and blood is found effused within the cavity of the arachnoid, and most commonly on the cerebellum.

A case of *absence of the cerebellum* is represented by Cruveilhier, pl. v., liv., 15.

Atrophy of the convolutions of the brain (Agnesia). Breschet gives an account of an idiot who lived till his fifteenth year, in whom both cerebral lobes were totally wanting (Rep. d'Anat. Path.).

The *tongue* may also be congenitally deformed, as too large, too small, too wide, too long, etc. Dr. S. Harris has described an interesting successful surgical operation for the removal of chronic congenital enlargement of the tongue (Am. Journ. Med. Sci., vol. vii. See Dict. des. Sci. Med., vol. xxvii., and Bartholinu's Hist. Anat., and Mem. de l'Inst. National).

Congenital ranula has been noticed by Billard.

Absence of the epiglottis, by Morgagni.

Hyper trophy of the tonsils, by Andral.

Complete absence of the pharynx has only been observed in acephalous monsters; an interesting malformation of it is related by Dr. Houston, in Dublin Hosp. Rep., vol. v.; and Andral observes that it often ends in a cul-de-sac.

Congenital Malformations of the œsophagus are not uncommon, and Sir A. Cooper has recorded an instance where it was entirely wanting; the pharynx terminating in a cul-de-sac, and the stomach having no cardiac orifice. Similar cases are related by M. M. Billard, *Journ. Comp. du Dict. des Sci. Med.*; and one by Blundell, *Obstetrics*, p. 50, where the œsophagus terminated in a ligamentous cord.

Cases of ulceration of the muciparous follicles of the œsophagus and stomach are related by Billard, (*Mal des Enf.*, p. 288, obs. 20, 21, 2d Fr. ed.).

Malformations of the Stomach.—The following have been related, viz., 1. Total absence. 2. Deficiency of cardiac orifice. 3. Separation from duodenum. 4. The great extremity wanting, the œsophagus entering the left. 5. Division by central contraction into two cavities. 6. Extreme smallness, so as not to exceed the size of the small intestine. 7. Great size, so as to fill almost the whole abdominal cavity. 8. Lateral transposition, in common with the other viscera

9. Considerable contraction of the left orifice, with absence of the pyloric valve (Fleischman).

Congenital Gastritis (follicular ulcer) has been met with fifteen times by M. Billard, and in repeated instances by Cruveilhier, as represented in his Anat. Path., plate 3d, fig. 4, 5, 6, (15 fasc). Cases of follicular ulceration of the stomach, oesophagus, pharynx, and mouth, are recorded by this writer, and by M. Denis in his Recherch. Anat. et de Phys. Path. Sur plusieurs Maladies des Enfans Nouveau-nés, 1826, p. 139.

Cases of congenital arachnitis, gastritis, and gastro-encephalitis, are related by Broussais, Ann. de la Med. Physiol., p. 139.

The *intestines* are also subject to congenital malformation, as they may be longer or shorter than natural, diminished or increased in caliber, the convolutions wanting, the canal forming a straight tube from the stomach to the rectum.

Several cases of this nature were found, on autopsy of children who died at the Chicago Foundlings' Home.

Deficiency of the Diaphragm has been observed by Diemerbroeck, as recorded by Lietaud, Obs. Anat. Med. obs., 792.

A case of *extreme atrophy of the intestines* is related by Dr. Francis, in Stewart's Billard, p. 602.

For cases of *malformation of the duodenum*, see Ed. Med. Mem., vol. v.; Billard (Mal des Enfans, pp. 362, 390, obs. 43; Journ. Comp. du Dict. des Sci. Med., vol. xxiv., p. 58.)

Billard has also described congenital *inflammation of the ileum*, attended with hypertrophy of the mucous membrane, and Dr. Francis, of New York, has described, in the *American Med. and Ph. Reg.*, vol. i., a case of diverticulum from the ileum in a man aged thirty-five, who died of enteritis. In one case of death from inanition at the Chicago Foundlings' Home, an opening was found into the abdominal cavity from the ileum.

Analogous malformations of various kinds, of the *cæcum*, *colon*, and *rectum*, are related by Meckel, Littré, Billard Baillie (Morb. An), Cruveilhier, Ascherson, Rudolphi, and others. Dr. Francis states that an instance came to his notice some years ago, of the small intestines, so-called, being in reality the larger, while nearly the whole tract of the colon and rectum was diminished in caliber, so as scarcely to admit the passage of a crow quill (Stewart's translation of Billard). A similar case was found in the Home, by the author.

Instances of *congestion and inflammation of the intestines* have been related by Billard. Andry states that Doleus and Schrichter have met with bundles of worms in the intestines of the foetus, and that Roses (*Dis. of Children*) mentions two affected with *taenia*.

The *abdominal glands* have been found diseased in the foetus by Ochler and Cruveilhier, who have represented them (*Anat. Path. liv.*, 15, obs. ii.).

Cases of *lateral transposition* of the viscera have been recorded by Baillie (*Morb. Anat.*), Mery (*Mem. de l'Acad. des Sci.*, 1658), Daubenton, Payne, Blegny (*Zoo Gallie. June, Ann. ii.*, obs. ix., p. 129), Riolanus (*Disq. de Trans.*, part, and 1652), Otto (*Path. Anat.*, p. 29, Note), Parisot (*Arch. Gen. de Med.*, June 1839. *Med. Chir. Rev.*, 1836. *Am. Journ. Med. Sci.*, May, 1836), Raleigh, Warren, Snowden (*Lond. Med. Gazette*, June 11, 1839. *Med. Chir. Rev.*, Oct. 1837), Blundell, Jamieson, and Houston (*Cat. of Coll. of Surgeons, Dublin Mus.*, p. 61, b. 600). For cases of partial transformation of the viscera of the abdomen, see *Edinburg Med. and Surg. Journal*, for July, 1839 (Simpson); also *Ibid.*, vol. xvi. (Reid).

Hernia in the new-born infant is frequently met with, both of the inguinal and umbilical kind, the first of which is sometimes complicated with hydrocele. A case of strangulated congenital hernia is recorded by Dr. Hunt (*London Medical and Philosophical Journal*, Oct. 1828), in which an operation was successfully performed. Billard relates a case of hernia in a female infant, where the left ovary passed through the left ring and inguinal canal, and the uterus was drawn to the left side of the bladder. For instances of diaphragmatic hernia, see Bailie's *Morb. Anat.*, Clarke's *Transl.*, vol. ii., p. 118; *Journal Hebd.*, Feb., 1835, (Anthony); Cruveilhier fasc. 17; *Dublin Journal*, July, 1839 (Murphy); *Ed. Journal*, July, 1839 (Simpson); *Anat. Path.*, cent. vi., vol. iii., p. 287 (Bartholin); *Bull. de la Fac.*, vol. ii., (Chaussier); *Ed. Medical and Surgical Journal*, 1821; *Path. Chir.*, Paris, 1831, p. 128 (Cloquet); *New York Journ. Med. and Collat. Sci.*, vol. iii., 1844 (Darling).

Congenital Peritonitis is also a frequent occurrence, according to Billard (*Mal. des Enfans*), and Duges (*Rech. Sur les Mal., etc., des Nouveau-nés*, Paris, 1821). See a most elaborate paper on this subject by Dr. Simpson, in *Ed. Medical and Surgical Journal*, Oct. 1838, who has presented numerous cases of this accident in the new-born. See, also, *Dict. de Med.*, vol. xv. (Desormeaux); Morgagni, De Sed., etc., ep. 67; *Journ. Gen. de Med.*, vol. cii., 1828; Cruveilhier, liv., xv., p. 2;

Andral, An. Path., vol. ii., p. 737; Guy's Hospital Reports, No. 5.

Ascites is sometimes congenital, as well as anasarca and hydrothorax. See Duges, in Mem. de l'Acad. R. de Med., vol. i.; Journ. de Med. Chir. et Pharm., vol. xvii., p. 180; Cruveilhier, Anat. Path. liv., xv., obs. 4, 5, 2; Arch. gen. de Med., vol. viii., p. 383 (M. Ollivier d'Anger's), case of encysted dropsy, of remarkable size.

The *liver* has been found absent, small, or double, softened, indurated, lacerated, or containing pus, granular tubercles, tophi, etc. For a case where it was entirely wanting, consult *American Journal of Medical Sciences*, Nov. 1839 (Kieselbach). For an instance of double liver, see Morgagni, ep. 48-55. For other morbid conditions of this viscus, see Monograph "On Diseases of the Foetus," in *American Journal of Medical Science*, vols. xxvi. and xxviii., by W. C. Roberts, of New York, to whose learned research we are much indebted in drawing up the present notice.

To the same elaborate article we refer for congenital pathological states of the *gall-bladder*, *spleen*, etc.

VIABILITY OF THE MALFORMED.

CONSIDERED WITH REFERENCE TO CONGENITAL MALFORMATIONS AND DISEASES.

The question would naturally arise: is it possible for infants with congenital malformations and diseases to survive? The whole question of viability is a most important one, and we therefore give the article by Billard, it being the only one we have found in works on children, on this important subject:

"Viability is the capability of extra-uterine life; it should consist not only in the normal state of the organs of the infant, but likewise in the absence of all physiological and pathological causes capable of opposing the *establishment* or *prolongation* of independent existence. Thus, as Professor Orfila (*Lecons de Medecine Legale*, 2d edition, p. 511), has observed, an infant may have lived, and yet not have been regarded as viable, because some organic malformation may have prevented the prolongation of life; another child, born living, may perish in the first period of its life, although it was viable.

"The question of viability, then, must be considered with reference to the pathological causes which may be adverse to the establishment of life, and it is therefore necessary to have a proper estimate of these causes. It appears to me useful to ascertain how far congenital malformations and diseases of the new-born child may embarrass the establishment of life, for all congenital diseases are not productive of non-viability; some offer no impediment to the establishment and continuance of independent life, while others embarrass its development; the latter are the inevitable causes of the death of the child, and the study of their nature is the object of this dissertation.

"The various apparatuses and principal organs of the system will be reviewed, and the congenital malformations and diseases which may be developed during the evolution of the *fœtus* examined."

Billard divides this subject into two parts; the first will comprise the study of congenital diseases, and that of their influence upon the development of life; and the second the application of these data to legal medicine.

CONGENITAL MALFORMATIONS OF THE SKIN.

"Care must be taken not to mistake for a congenital disease the intense redness of the skin of a new-born child, and the epidermic exfoliation which occurs several days after birth; both of these are natural phenomena.

"Absence of the skin in one or more parts of the body has been noticed from the highest antiquity, on account of this lesion being found in the writings of Hippocrates (*De Genitura*, cap. 6), who has made it the subject of some very judicious observations. This congenital malformation is not adverse to the establishment of life in an infant, except when there coexists some other deformity, or when an organ is exposed which is essential to life. Thus, absence of the skin, with a wound on the limbs or face, is susceptible of cicatrization after birth, and can oppose no obstacle to the execution of the functions of life; but when absence of the skin results from an arrest of the development of the thoracic, abdominal or cranial parietes, this malformation must be fatal, for important organs are thereby deprived of their integuments, and the child is exposed to the most serious and fatal affections.

"Cutaneous excrescences, which are met with on the face, hands, and feet, are not causes of non-viability, at least if unaccompanied with a defective development in some other part; which, however, as Meckel observes, is of common occurrence. Thus, the cutaneous excrescence which is seen on the forehead of a foetal cyclops is not a dangerous deformity, except when it coexists with some other congenital malformation. Those cutaneous excrescences which are met with on the face alone, may be removed and cured without injury to the health of the child.

"It is the same with horny excrescences; but their existence on the human foetus is scarcely yet proved, and the passage which Haller has devoted to these extraordinary growths has no foundation but in facts very slightly authenticated.

"The excessive development of the pilous system at birth must be considered as an abnormal persistence of the hairs which cover the foetus about the middle of the intra-uterine life, and which generally fall off before birth. Far from considering these infants as animals deprived of their faculties, and consequently of the rights of civilization, as some ignorant persons have done, according to the account of Haller (*Opera minora*.—*De monstribus*, lib. i.), they ought to be examined with care, to see if there exist no other organic aberration, or some disease of the internal organs, which are adverse to the establishment of life, for this simple abnormal development of the pilous system cannot be a cause of non-viability. These hairs fall off some time after birth, and the infant then no longer exhibits this superficial and transitory anomaly, which ignorance alone could confound with the integuments of animals.

"Alterations in the color of the skin may be referred to petechiae, albinism, and cyanosis. Albinism can have no influence on viability. It exerts no influence in opposition to the prolongation of life, and albinos have been seen at an advanced age. (J. Geoffroy-Saint-Hilaire, *Histoire générale et particulière des anomalies de l'organisation dans l'homme et les animaux*. Paris, 1832). (I have seen two vigorous albino children, three and seven years of age).

"Petechiae and cyanosis, which are frequently seen in infants at birth, are ordinarily the symptoms of affections more or less serious, which doubtless may oppose the establishment of life; but attention must be paid more to these lesions than to the modification of the cutaneous pigment, which is of but little importance when separately considered."

Dr. Francis adds :

" We must ever bear in mind the clinical observation of Corvisart, that cyanosis, though often found associated with an open state of the foramen ovale, may yet exist without this imperfection; the blue color has been often manifested in early life, while no communication has been traced between the opposite sides of the heart. This patulous condition of the foramen ovale, though actually existing, is sometimes brought to evidence itself only when obstruction of the circulation through the lungs occurs, by pulmonic congestion or disease. Crampton tells us that he has seen several cases where there was a free opening between both auricles and ventricles, which must have subsisted for years, and yet in which there was no cyanosis. That the open state of the foramen ovale is not necessarily a cause of cyanosis, we have the authority of M. Ribes, in the case of a man of sixty years, in which the auricles communicated without there being any change in the color of the skin. In a recent fatal case of the puer coeruleus, occurring in a subject which survived but about thirteen days, and where the blue color was periodically intense, the intermission between each pulsation was very repeatedly seven minutes and a half, and on some occasions eleven or twelve minutes. The double relationship between the state of the lungs and that of the brain, deserves to be as closely scrutinized as the condition of the heart in cyanosis. We have all recently witnessed, by dissection, during the prevalence of the Asiatic cholera in New York, the influence on the vascular system, induced by obstructed circulation in the lungs and through the heart. A like remark may be made concerning the disordered phenomena, made so conspicuous by autopsic examination of bodies dead by the drinking of cold water during the extreme heats of our summer. In many of the cases which I have investigated, the lungs, and their proximate organ, the heart, have betrayed the pathognomonic signs of inordinate thoracic fullness, and a passive dilatation of the right ventricle. In deaths by lightning, I have sometimes traced, by dissection, appearances of a similar nature, with cerebral fullness, and doubtless accompanied with exhaustion of all nervous energy. So, too, by the dissection of the dead body of the gross inebriate, these local disgorgements may occasionally have been seen, while upon inquiry, it is readily ascertained that cyanosis has often characterized the external surface of the unfortunate victim previous to death. All these examples may be cited, to demonstrate a cyanose state, influencing a stagnation in the capillary system. In short, in the advanced stage of various affections, accompanied with a disordered circulation, we may often become the observers of this coerulean discoloration."

"Ecchymoses, sanguineous tumors, contusions of the integuments which ordinarily result from a local or general sanguineous congestion, ought always to be considered with reference to the causes which produce them; of themselves they are of no consequence. The spots and erectile tumors, which are described under the name of *nævi materni*, have no power over the viability of children, because they may live a long time with this deformity, which does not become mortal unless it is of great extent, or makes rapid progress.

"Congenital inflammations of the skin deserve the attention of the medical jurist. Infants have been born with measles or small-pox. Examples are given by Bartholin, Boerhaave, Van Swieten, Vogel, Jenner, Mauriceau, MM. Rayer, Duges, and others, of more recent date. Some of them were feeble and premature, and died a short time after birth. Children have been cured of these affections and lived a long time after. Consequently, if these inflammations of the skin are unaccompanied with any congenital malformation, or any other serious disease, they ought not to be considered as an obstacle to the establishment of independent life.

"Induration, or oedema of the cellular tissues, never exists alone, but is almost always accompanied with a state of congestion of the principal organs, and particularly of the respiratory and circulatory apparatus. This congestion is evidently adverse to the establishment of life, and offers, as we shall see below, a great hindrance to the viability of the child. It is not, therefore, to the oedema alone that we ought to direct our attention, when about to pronounce a judgment on the viability of an infant thus affected, but we ought to ascend to the examination of the accompanying lesions. As to those infants described by Uzembezius, that were born so cold and hard that they might have been mistaken for marble statues, no doubt can exist as to their non-viability, since they are almost always born dead. This kind of induration of the cellular and adipose tissue is generally the effect of decomposition.

CONGENITAL MALFORMATIONS OF THE DIGESTIVE APPARATUS.

"Absence of the buccal cavity, and also the absence of the anterior opening of the mouth, replaced sometimes only by an irregular orifice, situated at some part of the buccal cavity, ought to be considered as a cause of non-viability; as it is impossible for the child to exercise suction or deglutition, and it is even impossible to introduce drinks into the digestive passages. It is not so, however, with the more or less perfect occlusion of the mouth, in consequence of adhesions of the lips; this deformity does not necessarily affect the viability; for, by means of an operation, a passage may be established to the digestive organs. But when the absence of the mouth coexists with a congenital malformation of the face and cranium, this deformity ought to be regarded as a cause of non-viability.

"The same may be observed with regard to congenital division of the lips, palatine arch, and velum. The child may live a long time, whether no effort be made to relieve the infirmity, or an operation,

which is most frequently successful, be performed for that purpose. A monstrous development of the tongue is not an insurmountable obstacle to the functions of life. In the *Journal de Medecine de Vandermonde*, vol. xv., is recorded an account of a child born with a tongue of enormous size, the inferior extremity of which adhered to the gums of the lower jaw, by a spongy tumor, about the size of a filbert. After a time, this tumor became confounded with the tissue of the tongue, which steadily increased in size as the infant advanced in age. During this time, the child was sustained only by liquid aliments; it had become habituated to the practice of sucking by drawing the lower jaw considerably backward; at last, instructed by its wants, it was enabled to arrange the tongue and jaw so as to chew, and articulate sounds. This child, therefore, in spite of this infirmity, was viable, and was much more so because the tongue might have been reduced in size by an operation, and the proper form and use of the organ restored. Children are sometimes born with passive congestions of the mouth and tongue, which can have no influence on the development of life."

Francis to this justly remarks:

"It is essential in noticing cases of preternatural or abnormal growth of the tongue, to discriminate between congenital enlargements of that organ and glossitis, embracing the numerous causes which induce that condition, which in reality ought to be considered as the results of inflammatory action. Instances of this character have been encountered by many, who have remarked the deplorable effects of *Mercury* on some individuals. Dr. Good's Study of Medicine contains some valuable records of cases, illustrative of the remarks of our author."

"The extreme narrowness of the pharynx I have observed to coexist with that of the tongue; it interferes much with deglutition, but cannot be considered as a cause of non-viability.

"Congenital malformations of the œsophagus are almost always mortal; one species, that of stricture of the œsophagus, may allow the infant to swallow drinks, although with difficulty; but it is not so with obliteration, fissure, or duplicity of the œsophageal canal. Infants affected with obliteration of the œsophagus may exhibit congenital malformations externally, and which alone would remove all doubts that might be raised upon the medico-legal question of which we are treating; such is the case in the instance given by M. Lallemand, of Montpellier, in his inaugural dissertation. Dr. Sunderland, of Barmen, has given the history of a child born at the full time, and to appearance in good condition, that died at the end of eight days, after having continually vomited the aliments which had been given. On opening the body, the cardia was found wanting; the stomach adhered at this place to the diaphragm, by means of the cellular tissue. (*Journal Complementarie du Dictionarie des Sciences medicales*, tome viii., p. 369). With such a malformation, an infant must necessarily perish. The same fatal result will always occur when the

œsophageal canal is obstructed, interrupted, has a deviation from its natural direction, or is divided into several parts.

"Congenital inflammation of the œsophagus, without completely opposing the viability of the child, may very much disturb the exercise of life, and at last terminate fatally. I have seen, in two infants that died a short time after birth, ulcerations which were doubtless developed in the œsophagus during the latter part of intra-uterine life, and which, by the progress they made after birth, contributed greatly to hasten the death of these infants. It is possible to meet with a gelatinous softening of the œsophagus in a new-born child; in such an affection the infant vomits all that is given to it, and becomes rapidly emaciated from default in nutrition; and as the progress of the disorganization is continually increasing, perforations of the œsophagus are found upon examining the body after death. The gelatinous softening being a disorganization of tissue, and this disorganization having commenced or terminated before birth, cannot be cured and cicatrized. I am therefore of opinion that it ought to be regarded as an inevitable cause of death; consequently, infants that are born thus affected are not viable; the chances of life for them are very uncertain.

"The stomach exhibits no maladies except with reference to its situation and form. Displacement of the stomach offers no obstacle to life; it can discharge its functions when it is situated upon the right side as well as the left of the abdomen, or even when it is in the cavity of the thorax. The essential condition is, that the orifices be free; yet if it be adherent to those parts with which in a natural state it has no communication; if, for example, it should open into the colon, or occupy the place of the rectum, of which deviation, instances have been reported, although they are very incredible, it will be easily conceived that this infirmity would be regarded as one cause of non-viability.

"The diseases of the stomach consist of different degrees of sanguineous congestion, or of inflammation. Congestions of the stomach are of very common occurrence in young infants, and consequently but little importance ought to be attached to them, with reference to the subject before us. As to congenital inflammations, they are generally the causes of very serious symptoms. Congenital gastritis consists almost always of a number of ulcerations, the borders of which are of a very shining carmine hue, and the bottom of a deep yellow. These ulcers result from the disorganization of the gastric follicles of the stomach. The portion of the mucous membrane surrounding them remains white, notwithstanding the existence of inflammation, and the stomach generally contains a quantity of black, sanguinolent matters, resulting from the sanguineous exhalation which takes place from these ulcers on the surface of this viscus. When thus affected, the child exhibits no external sign of phlegmasia, and preserves its rotundity of form; but as soon as it is separated from the mother, and the gastric digestion becomes a process of the

greatest importance, it then falls into a state of marasmus, and vomits all that is given it to drink; brown matters, such as I have observed to exist in the surface of the organ, are discharged by vomiting; and it soon perishes if the ulcers, in place of cicatrizing, enlarge and become more numerous. This alteration of the stomach ought to be arranged among the causes which interfere with the development of life.

" Gelatinous softening of the stomach occurs sometimes very soon after birth, so that one is led to believe that it has already existed during intra-uterine life. If such an alteration should be found in an infant which had died on the first or second day after birth, ought it to be pronounced viable? I think not; for, according to all probability, this alteration existed at the time of birth; and it is generally so rapid in its progress, and so fatal in its results, that a child born with this affection should be considered necessarily dying, and consequently as not born viable.

" Congenital malformations of the intestinal tube are very numerous. A great number of instances are recorded in various works, particularly in the learned one of M. Meckel. (*Manual of Descriptive and Pathological Anatomy*). Schafer has published a memoir, in which, also, the principal anomalies of the digestive tube are pointed out. (*Journal Complementarie du dict. des Sciences Medicale*s, t. 24). Those which more particularly deserve our attention are interruptions of continuity, strictures, and obliterations. Every interruption of the intestinal canal ought to be considered as a cause of death. Obliteration will be more dangerous according to its position. Thus an infant having an obliteration at the duodenum, or some other part of the small intestines, at the caecum, colon, and the upper two thirds of the rectum, ought to be regarded as non-viable; but when the rectum exists, and the obliteration is near the orifice of the anus, the child might still be considered as viable, since an opening into the anus has been several times made by an incision through the cul-de-sac, formed by the obliteration of the rectum. When this intestine is wanting, although it is possible to form an artificial anus at the sigmoid flexure of the colon, yet I regard this condition as a cause of non-viability, inasmuch as the operation resorted to in similar cases has, to this day, almost always caused the death of children, while it is not so when a superficial incision is made at the perineum. Strictures more or less numerous throughout the extent of the digestive canal, are only embarrassments to the establishment of life, but ought not to be considered as an inevitable cause of death.

" The observations concerning congenital malformations of the intestinal canal, are in conformity with the experience of all conversant with autopsic examinations. An instance came within the inspection of Dr. Francis, in which the smaller intestines, so-called, being in reality the larger, while nearly the whole tract of colon and rectum was so diminished in its caliber as scarcely to admit the passage of a crow's quill. The child lived until the fourth day after

its birth, and no suspicion was entertained of any abnormal state until some forty hours of its life had passed, and the derangement of its excretory functions led to a closer scrutiny of its physical condition. Dissection made palpable the fatal peculiarity of structure. A similar case was found in the Chicago Foundlings' Home. A very striking variety of intestinal structure is recorded in the American Medical and Philosophical Register, of New York, which deserves to be adverted to in these addenda, not only on account of its extreme rarity, but because of its signal influence as an efficient agent in determining the fatality of various affections of the bowels. This case of peculiarity of formation is denominated a *diverticulum from the ileum attached to the umbilicus*. The patient died from obstruction and enteric inflammation. The preternatural formation was about three inches in length, and so firmly attached to the umbilicus as to leave no doubt of its having been a congenital product; and yet this patient had arrived at the age of thirty-five years!

"Congestions, and intestinal haemorrhages, which are observed in infants at birth, phlegmatic alterations, such as inflammation and ulceration of the muciparous follicles, are also serious symptoms, but not absolutely mortal in young infants. It is not uncommon to see infants pass by stool, with or without the evacuation of the meconium, a greater or less quantity of blood, the result of intestinal exhalation, arising from congestion of the intestines. Infants do not always die from this cause, especially in our climate; but this species of dysentery cuts off, on the contrary, a vast number in America, where cholera infantum prevails epidemically. If it be proved that a child can survive this disease, it must be admitted that it is not essentially mortal. This, however, is not so with the white or pultaceous softening of the mucous membrane of the intestines. I have, in three instances, seen this disorganization of the mucous membrane in children that were born pale and debilitated, and that died a very short time after birth. This softening I regard as a true disorganization of the mucous tissue, which nothing can restore; the membrane, consequently, is incapable of discharging its digestive functions, which are of indispensable importance at the commencement of life, and at an age when nutrition is the dominant and essential function of the system. We should carefully guard against confounding this softening with the mucous that is often spread over the whole internal surface of the digestive tube of infants. I would, therefore, pronounce an infant non-viable where there was found to exist a universal and complete softening of the internal membrane of the intestines.

On this subject, Dr. Francis comments as follows:

"The remarks on the disorganization of the muciparous follicles of the intestines are of unquestionable importance in a practical and in a medico-judicial point of view. The cause which he seems to have assigned as the origin of the cholera infantum in America, is too restricted; though there is a sound and important inference to be drawn from his reflections on the nature and character of the different

species of alvine discharges depending on the diseased condition of the internal lining of the intestinal tube. The white or pultaceous softening of the mucous membrane of the intestine is undoubtedly conspicuous among the causes of this affection; and as it is a disorder often occurring among the inhabitants of warm climates, we may be led to infer that disorganization in the functions of the liver is at times to be enumerated among the sources in its production. Dr. Baillie, in the Medical Transactions of the College of Physicians, of London, vol. iv, has a paper on a kindred affection, which he has termed a *peculiar species of purging*, and which he says is hardly ever radically removed. Persons who have resided for a considerable time in a warm climate, he observes, and those who have suffered from affections of the liver, are more liable to it; but it occasionally takes place in those who have never been out of Great Britain, and who have never suffered from any disease of the liver. It occurs more frequently in men than in women; but this, he thinks, most probably depends in a great measure, upon a larger proportion of men going to warm climates than of women.

"This affection is sometimes found to afflict individuals who arrive in New York from our southern states. In all the cases which I have seen, they were male subjects; and of eight instances of the complaint, two were evidently blended with hepatic disturbance."

CONGENITAL DEVIATIONS OF URINARY APPARATUS.

"Absence of a kidney cannot be considerd an obstacle to the establishment of life; neither can nephritis from calculi, which is sometimes found in new-born children; but renal dropsy, an affection that has existed in infants at birth, is certainly a cause of non-viability. This species of congenital dropsy occurs in the following manner: an obstruction, whether it be stricture or obliteration, exists in some part of the ureters; in proportion as the kidneys are organized, the fluid which it secretes, finding no outlet, flows back into the pelvis and infundibuli of the kidney; the substance of the kidney becomes engorged and distended, and assumes the form of an agglomeration of vesicles—an arrangement analogous, in every respect, to what it had at the period of its formation; this vesicular mass is constantly augmenting; it at last produces a great distension of the abdomen, and soon causes the death of the child—an event of necessary occurrence with such an infirmity. This obstruction, instead of existing in the ureter, is sometimes found at the neck of the bladder, or at a part near the root of the pelvis; under such circumstances, both kidneys, and the bladder itself, are distended with fluid. The bladder may acquire an enormous size, and, in advancing toward the abdomen, draw with it, out of the pelvis, the contiguous parts, dragging even the rectum from its place, presenting that malformation which has been described under the name of coalition with the bladder. An infant thus affected is evidently not viable.

"If the rectum, in adhering to the bladder, opens into it in such a manner that the contents of the intestines find an outlet by this

organ, viability will not be impossible. If an obstruction exist in the urinary passages, accessible to the surgeon, as near the gland, or in a portion of the canal between the root of the penis and the meatus urinarius, so that, with the aid of an incision, an artificial hypospadias can be formed, and in this manner give a free passage to the urine. I believe that then the infant may be regarded as viable, because, although affected with an infirmity which is adverse to the establishment of life, is not a cause of death which admits of no remedy. The extroversion of the bladder, an affection always coexisting with a separation of the linea alba, is not necessarily a cause of premature death, since individuals have lived to an age somewhat advanced with this infirmity.

"Inflammation and tumefaction at the neck of the bladder may prevent a flow of urine, and cause a retention which soon ends in the death of the child. This lesion must not be lost sight of in the examination of the causes which may determine the death of an infant whose viability is brought in question.

CONGENITAL PERITONITIS.

"Peritonitis frequently exists in new-born infants, either in an acute or chronic state. I have seen, in the dead bodies of two infants, that died, the one eighteen hours, the other twenty-four hours after birth, several old and well organized adhesions, uniting some of the convolutions of the intestines; one of these infants was pale, small and thin, the other was in the ordinary good condition of an infant at birth. The existence of these products of phlegmasia ought to be taken into consideration when ascertaining the causes of an infant's death. Acute peritonitis has been several times seen in infants, who appeared to have brought the disease into the world with them. M. Duges has reported several examples of this congenital affection in his inaugural dissertation. I have found acute peritonitis in three children that died a short time after birth. These phlegmasiae are of a nature serious enough to endanger the life of the child, but, as they can be cured, they ought to be arranged among the obstacles of life, and not among the necessary causes of non-viability.

"Ascitis may be met with in infants at birth; the fluid which distends the abdomen is in greater or less quantity. In an infant born dead, there was found nearly a pint of water in the abdomen, thorax, and other parts of the body; and what was the most singular in this case was, that the child was born of a dropsical mother (*Journal de Med.*, par A. Roux, tome 17, p. 180). Dr. Ollivier, of Angers, has reported an instance of encysted dropsy in a foetus born dead. Congenital dropsy ought to be considered as an impediment to viability, for the abundance of fluid in the abdominal, and sometimes in the thoracic cavity, hinders, in a very evident manner, the movement of the diaphragm, and the dilatation of the thoracic parietes in the act of respiration.

ABDOMINAL HERNIAS.

Umbilical hernia is not mortal; time, and proper surgical appli-

cations, can effect a cure, and even if they do not succeed, the continuance of this infirmity is no obstacle to the indefinite prolongation of life. It is the same with congenital inguinal hernia; but when one part of the abdominal viscera escapes by an opening in the parietes of the abdomen, in such a manner that the liver, intestines, and the mesentery are exposed, or when hernia of the diaphragm exists, no doubt can exist in reference to the non-viability of the child, which, if not born dead, must soon expire.

MALFORMED RESPIRATORY APPARATUS.

"The integrity of the respiratory apparatus in an infant at birth, is one of the first conditions of viability; indeed, it is in this apparatus that the principal phenomena occur, which establish the passage from intra-uterine to independent life; it is this which is the source of new life to the infant, and consequently, all the lesions that are developed in it may endanger its existence.

"Medical jurists only admit infants to have lived when they have respired; for with them, to respire is to live; it follows, therefore, that whatever is adverse to respiration, is likewise adverse to life. Let us, on this account, examine with particular care the congenital malformations and affections of the respiratory apparatus; comprehending, in this term, the nasal fossæ, larynx, trachea, and lungs. The congenital malformations of the nose, the union of the two lateral nasal fossæ, forming thereby but one cavity, almost always exist with a malformation of the face or cranium, such as monopsia, anencephalia, or hydrocephalia; and experience proves that a foetus so affected can scarcely live, only a few moments, more by reason of the complication of these organic deviations than by the deformity of the nasal fossæ; this monstrosity, therefore, must be regarded as a cause of non-viability. The larynx is habitually the seat of a passive congestion, more or less complete, in infants at birth; care must be taken not to regard this redness, which almost always exists in this tube in young infants, for a phlegmasia; the trachea and bronchiæ are very often obstructed by mucus, which, if it is abundant and viscid, opposes an obstacle to the introduction of air into the lungs, and is, therefore, evidently a condition opposed to the establishment of life. Congenital inflammation of the larynx and of the trachea is rarely seen; but if sanguineous congestion and accumulation of mucus can oppose the establishment of respiration, it is easily conceived that simple phlegmasia, or phlegmasia complicated with an alteration of secretion, occurring in the latter period of intra-uterine life, would very considerably hinder the establishment of life.

"Congenital malformations of the lungs are not common, but those of the cavity of the thorax are frequently seen; when the parietes are defective, in such a manner as to expose the heart and lungs, the child must necessarily perish. Bianchi and Fracassini have given several examples, as quoted by Haller. Inversion of the right lung to the left side, and vice versa, offers no impediment to life. Con-

genital malformation of the thorax, which opposes a free expansion of the lungs, very seriously influences respiration, and gives rise to symptoms which are continued even to a period far advanced in life, according to an account given by M. Dupuytren; but the simple lateral depression of the thorax, while it is the source of some symptoms, it certainly is not a cause of death. If the malformation of the thoracic parietes exist at the diaphragm; if, for example, a perforation of this muscle allows the abdominal viscera to penetrate into the cavity of the thorax, we can, without hesitation, pronounce the child non-viable; for it is impossible for life to be prolonged with such an organic deviation; it can only live where a small portion of the organ has protruded.

"Inflammation of the pleura, lungs, or bronchia, may take place before birth; some authors, and among them Mauriceau, have reported instances of its occurrence. I have seen, in three infants that died on the first day after birth, a hepatization of the lungs, sufficiently advanced to cause the belief that, if this hepatization had occurred during intra-uterine life, it was at least developed during birth, or immediately after parturition. Whatever may have been the period of its development, it was evident that it had arrested the establishment of respiration, and consequently caused the death of the child. I have also found, in an infant that died some days after birth, evident traces of chronic pleurisy, which doubtless was the cause of the extreme feebleness with which this child was affected. These facts should lead us to the belief that infants born with congenital pneumonia are not viable. It is the same with new-born children that respire with greater or less facility during the first hours of their existence, and where pneumonia, or a pulmonary engorgement, supervenes, drives out the air already introduced into the pulmonary tissue, does not allow it to penetrate anew, and in this manner renders these organs unfit to discharge their functions. I have noticed several facts in support of this opinion, which have been communicated to Professor Orfila.

"There is still another circumstance which is adverse to the introduction of air into the lungs, and which renders the child incapable of independent life; i. e., the extreme feebleness of the infant, and the difficulty with which it dilates the thoracic parietes, which, remaining almost immovable, do not perform the movements of inspiration, by which the air suddenly passes into the air-passages and penetrates the tissue of the lungs. Notwithstanding this non-existence of respiration, children may yet live some hours, and even days; and if the lungs are examined after death, not the least trace of air will be found in them. The following example, which I met with at the Hospice des Enfans Trouves, is in support of this assertion. Three infants born at one birth, on the night of the 21st of October, 1826, were brought immediately to the institution; they were all feeble, and, as it were, dying; one of them died eleven hours after birth. The *docimasia pulmonum* was made with the greatest care, yet not

the slightest trace of air could be found in the pulmonary tissue; the lungs exhibited nothing more than a slight sanguineous congestion at their borders; at no point were they hepatalized; therefore it was not the presence of blood in the cells of the lungs which opposed the introduction of air; but its absence was owing to the entire inability of the infant to dilate the thoracic parietes in a manner that would render the lungs permeable to the air.

" It is possible, therefore, for an infant to live without respiration, and consequently to live without being viable; this fact, which we have already demonstrated, when considering certain congenital malformations which of necessity result in death, is here exhibited in a new form. But it should be recollect that the life of an infant that does not respire presents peculiar signs, which distinguish it from independent life, properly so called. Let us examine these signs.

" It is difficult to explain the cause which sustains the precarious life of an infant that languishes for some hours after birth. Does it still live by its embryotic life? that is to say, does the oxygenation of the blood, from its mixture with that of the mother while connected with her, still continue for some time to sustain existence? Or, does the infant absorb a sufficiency of oxygen by the mucous surfaces exposed to the contact of the ambient air, to enable this agent of life to animate the debilitated being of which we are speaking? These are nice questions, and which the state of physiology even at the present day does not enable us to answer. Be this as it may, the signs of life in an infant where the respiratory system cannot discharge their functions, are the following: First, the pulsations of the heart are always slow, obscure and irregular. Second, the motions of the lips and of the limbs are very slow, and almost nothing; the muscles of the face are immovable, or are from time to time pinched, to return shortly to the state of immobility which imparts to the physiognomy its peculiar trait of destitution of expression. Third, the cry, which in its natural state is composed of two distinct parts, the one corresponding with inspiration, the other with expiration, is here only heard in one of its parts—that which arises from inspiration, and consists of an acute sound, more frequently smothered, and generally tremulous and jerking. Lastly, the integuments are cold and livid, in place of possessing the soft and moist warmth so peculiar to infants at birth.

" From such an assemblage of signs of imperfect life, it is, that midwives and even physicians often take their evidences of viability; and upon these data, frequently more vague from their incapability of appreciating them, are based their examinations and their reports; and judges, who are obliged to pronounce upon the viability of an infant, upon whose life important interests often depend, are exposed to the hazard of declaring an infant viable that was not so. We should not, therefore, be hasty in pronouncing upon the viability of an infant from the symptoms which were observed during life, but decide only after a post mortem examination is made. In vain would

the witnesses affirm that they saw the child move, cry, and even attempt to take the breast ; if the lungs have not been filled with air, the child could not have been viable, although it may have lived ; because it had not lived the extra-uterine life—viability consisting in the establishment of independent life, and in the absence of every cause that may prevent its prolongation. Neither should a child be considered as viable that during birth was suddenly attacked with pneumonia, in consequence of which the air was more or less completely expelled from the lungs. There then occurs a kind of struggle between the attempts of nature to establish life, and the pathological causes which oppose it. The death of the infant from the first moment of birth is the inevitable result of such a disorder.

" If at the end of some days, after the respiration has been fully and regularly accomplished, the child dies from inflammation of the pleura or lungs, it ought not on that account to be regarded as non-viable ; but the affection which has supervened ought to be taken into account, and considered solely as being adverse to the prolongation of extra-uterine life. I have, in several instances, seen infants that at birth respired perfectly well, affected with an hepatization supervening in the tissue of the lungs, by which the air was expelled from them ; but I never saw both lungs so completely hepatized that no portion of their tissue was without air.

" Simple pulmonary congestion without inflammation is equally embarrassing to the introduction of air into the lungs. There exists between respiration and circulation so close a connection that a disturbance of the one will almost necessarily produce a disturbance in the other. Some children exhibit at birth so great a sanguineous turgescence that blood is exhaled in all parts, and remains stagnant even in the parts that are the least depending. The heart, lungs, and liver are more especially affected with this congestion ; the lungs do not then receive the air which the infant inspires, or at least receive but a small part of it. Children born in this condition have ordinarily their limbs oedematous, and the integuments of a violet hue ; their movements are slow and difficult, and their cry is almost always stifled. The beatings of the heart are obscure, and the pulsations almost imperceptible. The child, in a state of sinking and prostration, languishes for some hours, or even days, and at last dies. On opening the body, a small quantity of air will be found at the anterior border of the lungs, the greater part of which will be gorged with blood, with their surface emphysematous. In such a case, a mechanical obstacle hinders the air from penetrating the lungs, and death occurs from asphyxia. An infant, born and dying under these circumstances, cannot be pronounced viable ; for death is the most ordinary consequence of this congenital sanguineous plethora.

" The facts of the early hepatization of the lungs," says Dr. Francis. " have occasionally been observed by American pathologists. We may also add that the phenomena of partial respiration, as recorded by Mons. B., by which the infant may seem to be endowed with life.

and yet shortly expire from the want of a free and permeable respiration, have been witnessed by every physician extensively engaged in obstetrical practice. That instances of asphyxia in new-born infants are sometimes the result of the action of *Ergot* or spurred rye, administered during labor, cannot admit of doubt. Several of my medical friends have observed cases of asphyxia arising from this origin; and I feel persuaded that the annual list of stillborn infants, published by our constituted authorities in the bills of mortality, is greatly increased in numbers by the use of this potent agent. Indeed, I deem it expedient that in all cases of stillborn children, inquiry should be made whether *Ergot* had been administered during the parturition." This use of *Ergot* by midwives has been interdicted by the German government for this reason. This is a severe commentary on Allopathic practice.

MALFORMATIONS, ETC., OF THE CIRCULATORY APPARATUS.

" Malformations of the heart are not all causes of non-viability. An unusual situation of this organ without complication, such as the existence of the heart on the right side of the thoracic cavity instead of the left, is not an obstacle to the establishment of life; but when it is situated in the abdomen, with a deficiency of a greater or less portion of the diaphragm; or when the parietes of the thorax are open, allowing of its escape from its proper cavity; and lastly, when this transposition of the center of the circulatory system is accompanied with an anencephalia, or acephalia, coincidents not uncommon, as M. Breschet has demonstrated in his memoir on ectopia of the heart, then the infant cannot be regarded as viable. Absence of one of the lateral portions of the heart, so as to leave, as it were, a single heart, is also opposed to viability. Dr. Mauran, of Providence, R. I., has recently published a case of a heart having but one auricle and one ventricle. The child was affected with cyanosis; lived fifteen days, during which time it was attacked with frequent syncopes, and threatened constantly with suffocation. It perished in one of these attacks of suffocation. The separation of the heart into parts ought to be arranged among the causes of non-viability.

" As to the malformations which consist in a narrowness of the orifices, or in a deformity or incomplete development of the valves, they present less danger to the life of a child than the preceding malformations; they hinder the exercise of the regular functions of the heart, and give rise to some peculiar symptoms; but they are not necessarily a cause of death, since individuals are seen living to a very advanced age with such congenital malformations. It is the same with the persistence of the foramen ovale, which is sometimes seen at an age considerably advanced, and which, although productive of some serious symptoms, will not on that account cause the individuals to perish. I once found a scirrhous tumor in the anterior part of the left ventricle. This alteration ought to be considered as a cause of non-viability, for it is known that it is the character of scirrhous tumors to be always growing, and at the same time to make

rapid progress. Now the progress of these tumors will inevitably derange, or even interrupt, the functions of the heart of the infant, if death does not occur a short time after birth. Anomalies in the distribution of vessels are not always a cause of death, because no part of the system possesses greater facilities of supplying deficiencies in the organs than the vascular. The multiplied divisions, communications, and relations of the different branches of an arterial trunk, are well adapted to restore the course of the blood through the different parts of the obliterated portion. The admirable researches made during the last twenty years on the subject of the diseases of the heart and blood vessels, have unveiled to us, in cases like these, the great resources of nature.

"The anatomical examination of the circulating organs of an infant at birth, show that the passage from intra-uterine to independent life is effected by transitions prepared and conducted in some manner by nature. The obliteration of the foetal opening occurs gradually; already narrowed at the period of the expulsion of the foetus from the uterus, they are not entirely closed until some days after birth, and this gradual transition from the form of the foetal heart and vessels to their ordinary form, is productive of no symptom in the young infant; it is therefore very common to find the foramen ovale and ductus arteriosus open in the child several days after birth; this persistence of the foetal openings, in the case of the death of a child, must not be considered as a cause of its death; and if it be not complicated with some lesion, or other congenital malformation, the child thus affected ought not to be pronounced non-viable. I once found an aneurism of the arterial duct in an infant four days old, that during life did not exhibit the least symptom of such affection. This aneurism, which was about the size of a cherry-pit, contained a layer of fibrin, which had begun to obliterate the canal; thus anticipating, as it were, the symptoms which might have resulted from an abnormal obliteration of its canal.

"Pericarditis is sometimes observed in infants at birth. This inflammation is very rapid in its progress, and very serious in its results, the child affected dying very soon after it is attacked; in seven cases of this disease, met with during the year 1826, at the Hospice des Enfans Trouves, I found two infants in whom it had been fatal the second day of their birth. I also found in an infant of two days, adhesions between the laminae of the pericardium, of so great solidity as to warrant the belief that they were the product of a former pericarditis, developed during the formation of the foetus. When an infant dies from pericarditis on the day, or the day after birth, it ought to be declared non-viable, because all circumstances would lead to the belief that it was born with the affection, and the violence of the inflammation would necessarily embarrass and suspend the important functions of the heart at a period when the blood takes a new course, and the center of the circulatory system needs the assistance of additional activity.

MALFORMATIONS OF THE CEREBRO-SPINAL APPARATUS.

"The cerebro-spinal apparatus is subject to frequent anomalies; almost all of them cause the death of the child; these organs being the center of life, nothing can supply their place when they are wanting, either in whole or in part. Yet they offer still different degrees of deformity, according to which, the child is more or less viable, if the term may be used; that is to say, that these deviations of the cerebro-spinal apparatus may have, in certain cases, such an influence over the rest of the system as to determine promptly and necessarily the death of the child, while under other circumstances, it may live for a length of time, although affected with a congenital malformation of the encephalic organ. The analytical examination of these different cases will enable us to understand their difference.

"Complete acephalia is always a cause of death, and requires no comment; it is the same with anencephalia.

"Anencephalia consists, as is well known, of absence of a part of the brain, to a greater or less extent; the brain is imperfect, in consequence of an arrest of development, or of a cerebral or meningeal affection, occurring during intra-uterine life. It is necessary to distinguish cerebral atrophy from anencephalia.

"Atrophy, or imperfection of the cerebral mass, is no obstacle to viability. Children are seen born with a cranium and brain extremely small; the forehead is sometimes so depressed that the face assumes a peculiar expression, having a nearer resemblance to that of an inferior animal than to the head of a human creature. Yet children affected in this manner live, and exhibit nothing different from others, so long as the vegetative life is the only one existing. Should they arrive at an age when the intellectual faculties are developed, their intelligence is nothing, or almost nothing, possessing scarcely any other consciousness than that of their physical or instinctive wants. In a word, they continue idiots during life; for nothing is more common than to meet with a kind of cerebral atrophy in idiots. In these individuals, says Georget (*De la Folie, Paris, 1820*), the forehead retires very obliquely backward, which gives to them a great resemblance to the lower animals. The cranium of an idiot is sometimes no more than sixteen, seventeen, or eighteen inches in circumference; those of sixteen inches bear but little resemblance to the human head. M. Esquirol, at the Salpetriere, had a plaster model of a young idiot, the anterior part of whose brain was so flattened and depressed that it resembled, in every respect, that of a sheep. At the hospital at Angers I examined the body of an idiot that died at the age of fifty years; the cranium, very much depressed at its anterior and lateral parts, arose in a point toward the occiput; the bones were of remarkable thickness, while the brain was reduced to a very small size; the cerebral hemispheres were two-thirds smaller than what is common in men; and what is still more remarkable, the cineritius matter consisted of nothing more than a thin lamina; the atrophy of this organ appeared particularly to have occurred in this substance.

"These different stages of cerebral atrophy, which are to be regarded as the first stage of anencephalia, are met with in individuals that are viable, since they have arrived at a considerably advanced age. Let us observe, besides, that their viability is to be considered as referring to vegetative life. Now, this kind of suspension of cerebral evolution, without doubt, hinders the development of the intellectual faculties. But of what importance is it here that the moral faculties remain fixed at the lowest degree of human intelligence, provided the conditions of vegetative life are fulfilled? And viability so effectually exhibits itself here in its plenitude, that individuals in whom cerebral atrophy coincides with their nullity of ideas, often arrive, in the course of their life, at a state of physical development strongly in contrast with the emaciation and debility of those feeble and sickly men, in whom we admire the possession of all that the human thought has of the brilliant and sublime. It is not uncommon to find, among those men whose scientific or literary productions have rendered illustrious, beings so ill-favored as Pascal and Pope. It is well known that the diminutive size of Winslow presented a striking contrast with the strength of his intellectual powers. 'Weaker and wiser,' seems to be the rule of to-day.

"The smallness of the cranium and brain in infants that afterward become idiots, is no obstacle to viability, which, considered in the rigorous acceptation of the term, indicates particularly an aptitude of vegetative or organic life.

"But when anencephalia arrives at a stage much more advanced than that which we have just described, the existence of the child is more doubtful, and it may be said that the degrees of viability diminish in proportion as the brain becomes more disorganized. At the Hospice des Enfans Trouves was a case which exhibits the intermediate stage of cerebral atrophy, of which we have been speaking, and anencephalia advanced to the degree necessary to cause the death of the infant:

'January 26, 1826, there was brought to the Hospice des Enfans Trouves a female infant named Verdelet. A paper attached to the arm mentioned the age of the child to be twenty-four days; it was of medium strength; size seventeen inches; the integuments were purple, cry stifled, thorax slightly sonorous on percussion; forehead very much sunk, and the parietal region depressed. From the close approximation of the bones of the cranium, there existed no anterior fontanelle. At the occiput, about the lambdoidal suture, there was a blunt projection. The eyes projected outside of the orbit, the superior borders of which were depressed. The head, inclined backward, and the face directed upward, gave to the physiognomy of this infant the peculiar expression of anencephalia. The child died on the 11th of February, without presenting any other symptom than those pointed out above. Upon a post mortem examination, the lungs were found hepatized at their summit and posterior border. The foramen ovale was still open, but the ductus arteriosus was obliterated. The cranial

vault and the posterior portion of the vertebrae being removed, the medulla spinalis was found perfect throughout its whole extent; the corpora pyramidalia and corpora olivaria were very much developed. In examining the brain from behind forward, the pons varolii, tubercula quadrigemina, infundibulum, tuber cinereum, the pituitary gland and commissure of the optic nerves, were found in their normal state. The distinction between the posterior and middle lobes was well marked; but the anterior lobe could scarcely be recognized, and instead of presenting a slightly convoluted and furrowed surface, there was nothing to be seen but two reddish eminences, about the size of a filbert, separated from each other by a slightly-marked division, but reunited posteriorly by the anterior commissure; at the anterior part there did not appear the fossæ in which are lodged the olfactory nerves; but they were blended posteriorly with the cerebral substance, from which they were separated anteriorly, and their terminations reflected on themselves and rounded, were attached to the lateral apophysis of the cristi galli. When the brain was examined superiorly, the posterior part of the hemispheres was found developed as in the natural state; but the convolutions were suddenly interrupted in the anterior part of the brain, and ceased in the direction of a line which would be in continuation of the fissure of Sylvius. The superior and anterior part of the brain was consequently wanting altogether. There did not exist any corpus callosum; the posterior commissure was the only vestige of it. There was no septum, consequently the anterior part of the lateral ventricles was exposed. Immediately before the interruption of the convolutions, there was a depression, in which was found a membranous pouch, enclosing a small quantity of citron-colored serum, formed probably from the pia mater and tunica arachnoidea, which were filled with vessels. This pouch had no external opening. When cut longitudinally, two small, olive-shaped eminences were exposed, separated by a deep furrow, and upon which were two white bandalettes, united anteriorly in the form of a V, and separating posteriorly, so as to extend below the interrupted convolutions. These were the rudiments of the fornix. Between these bands an interval was left, which is usually occupied by the septum lucidum. The anterior projections, rugous and irregular, were evidently formed by the thalami nervorum opticorum, the internal borders of which constituted the third ventricle, communicating largely with the lateral ventricles, by means of the fornix, below which was seen the tela choroidea. On each side of the fornix was seen the posterior extremity of the plexus chorooides. When the posterior portion of the cerebral hemispheres was removed, the lateral ventricles were seen to be continued behind, spread and form, as usual, the aencyloid cavity. Behind the thalami optici the corpora striata could scarcely be distinguished, but some pulposus matter presented a few traces of them; the cerebellum was perfect.

"The vessels from the vertebral and carotid arteries were distributed at the base of the cranium, in the accustomed manner.

"One of the principal branches of the carotid was directed toward the point corresponding with the fifth ventricle, and sent branches which lost themselves between the convolutions, and others spread over the surface of the membranous pouch of which I have spoken. All the nerves of the base of the brain were in their points of origin and disposition perfectly normal. The base was slightly depressed in its lateral parts, so that the anterior fossæ were much less developed than the middle and posterior."

"I have reported this case in detail, to show that an infant can live a long time with the absence of some one of the parts which constitute the encephalic mass. The form of the cranium corresponded with the deformity of the brain, and it might be thought that the brain of this child was analogous to those of the idiots of which we have spoken; but there not only existed in this case an atrophy of the organ, but likewise an absence of several portions which enter into its composition. This advanced stage of anencephalia ought to be regarded as a cause of non-viability. This infant lived without being viable; that is to say, without exhibiting the organic conditions which are indispensable to a prolongation of independent life.

"Deformity of the cranium does not always exist in conjunction with congenital malformations of the brain. M. Breschet has given several instances of well-formed crania, containing a mutilated and incomplete brain. To the facts with which he has enriched science, I can add the following case:

'Hospice des Enfans Trouves, on the 11th of March, 1826, Noblet, aged three days, a male, entered. During his continuance in the hospital he cried, sucked his thumb, and took the breast of the nurse. He was examined on the 12th, and directed to be sent to the country on the next day, but died during the night. The post mortem examination was made on the succeeding day; the child exhibited exteriorly, a good condition; several livid marks were upon the body. Follicular ulcers were found in the stomach, and there was a general congestion of the intestinal tube. The lungs were healthy and crepitating.'

"The cranium presented a very strongly-marked development, but when opened, was found to be filled with a membranous pouch, covered with a number of vessels, and filled with a fluid having the appearance and color of the white of an egg. It was easy to discover that this pouch was formed of the pia mater and arachnoidea. As soon as it was pierced, the liquid matter flowed out upon a mass of cerebral substance, at the base of the cranium, of which I shall presently give a description. The medulla spinalis was perfect; the corpora pyramidalia and corpora olivaria were fully developed; the cerebellum was well formed; the pons varolii also presented its usual size and form, but the anterior cornua gave rise to four projections, two on the left, and two on the right side; the internal ones appeared to be the vestiges of the thalami optici, and were separated by an interval which in a healthy state would have constituted the third

ventricle. The two others appeared to be the vestiges of the corpora striata; they were partly covered by a membranous fold, which appeared to be the plexus choroides. Lastly, outside of the parts described there was found a pulpy mass, flattened and very soft, and which, without doubt, represented the rudiments of the two cerebral hemispheres. These two portions of cerebral substance were confounded with the internal surface of the meninges, which was found covered with the pulpy appearances very analogous to the substance of the brain. When the inferior surface of this rudiment of brain was examined, the olfactory nerves were found to exist only in the form of thin, fragile, medullary filaments. The commissure of the optic nerves was scarcely visible; the nerves at the place where they arose were almost nothing, while in the orbit they possessed their usual development. All the other nerves at the base of the brain were developed in the ordinary manner. The arteries furnished by the carotid and the basilar trunk of the vertebral artery, had their usual distribution, and their branches were sent to the walls of the pouch formed of the meninges. There were therefore wanting in this brain, first, the entire two hemispheres; second, the corpus callosum; third, the fornix; fourth, the lateral ventricles; fifth, tela choroidea; sixth, the anterior and posterior commissures.'

"If the cranium of this child had not been opened, the cause of its death would not have been suspected, and perhaps it would have been pronounced viable. Life was maintained during the three days by the nervous influence of the medulla oblongata, which the organic deviation did not affect.

"It is not necessary to demonstrate the non-viability of an anencephalous fetus, where the cranium is destroyed and perforated; it is well known that such a one can exist but a few hours.

"We ought to point out apoplexy of new-born infants as a cause of death, and particularly the general softening of the brain, which is sometimes found in young infants, mixed with thickened blood, and diffusing a strong odor of sulphuretted hydrogen, indicating evidently the decomposition of the organ.

"Hydrocephalus is not a cause of non-viability, except when the cranium is of a great size, and the fontanelles are widely spread. In this case, the cerebral ventricles are inordinately distended, and their walls softened and disorganized. Encephalocele, which sometimes accompanies dropsy of the brain, likewise renders the existence of the infant too precarious to allow us to expect it to live; encephalocele, without hydrocephalus, is not necessarily a cause of death; M. Lallemand found a hernia of the cerebellum in an aged woman at Salpetriere. But when hydrocephalus only exists, with an enlargement of the cranium, and especially when the fontanelles are but slightly enlarged it may be reasonably expected that the child will live even to an advanced age. Camper has observed that hydrocephalic infants will live so much the longer, as the bones of the cranium are more approximated, and their sutures are more solid; sometimes hydrocephalus is really an obstacle to viability.

" Meningitis, which supervenes sometimes immediately after birth, and which produces convulsions, is not a cause of death in all the infants affected with it; it should not, therefore, be regarded as absolutely mortal. Fractures of the cranium are not serious, except from their complications. Congenital malformations of the medulla oblongata are always fatal; hydrorachis, complicated with spina bifida, is not always to be considered as a fatal affection. And indeed, when the integuments of the tumor are perfect, the child may arrive at quite an advanced age; the progress of ossification may even lead to a perfect cure; but when the tumor is ulcerated, death is inevitable.

MALFORMATIONS OF OTHER PARTS.

" Congenital malformations of the genital organs, such as imperforation or absence of the vagina, are without doubt, very serious, but are not mortal in infants at birth; and death may not even occur at the period of puberty, since the menstrual evacuation has occurred from other surfaces than that which ordinarily secretes it; consequently we ought not to regard infants as incapable of living, that are affected with these congenital malformations.

" Fractures, luxations, or divisions of the limbs, are not causes of non-viability.

" The various cases of duplicate monstrosity, either by inclusion or coalition, cannot be submitted to general rules; but it is necessary to examine each case by itself, to appreciate properly the degree of viability of infants affected with this species of monstrosity.

" Let us now see what are the inferences which may be drawn from this analysis.

MEDICAL JURISPRUDENCE OF VIABILITY.

Infanticides are not as rigorously prosecuted in America as in France. Physicians are not as familiar with the medico-legal bearing of infanticide as they should be. We therefore add Billard's summary of the medico-legal deductions on viability, with additions.

"The question of viability in medical jurisprudence, presents itself in several points of view; sometimes there is required from the physician different investigations, according to the information necessary to be obtained. Should infanticide be the question at issue, it will be necessary to ascertain, first, whether the infant was *full grown*; second, whether it was *born living*; third, whether it was *viable*; fourth, whether it *had lived*. If, on the contrary, the questions to be decided refer to grants or testamentary discussions, the question of viability will present itself in a different form; for there are almost always two parties opposed, the one maintaining that the infant lived, and was viable, and the other assuming the contrary; and it will be necessary in the first place to show whether the infant had lived. Verbal testimony and the docimasia pulmonum will ascertain this point. If the child had not lived, and should the assertions of witnesses be contradictory, the physician, on ascertaining that there was not the least trace of air in the lungs, ought to discontinue any further investigations, for the question is settled by this fact; and in vain will it be alleged that the infant had respiration, and that pneumonia had supervened and had driven the air from the lungs; and although we have before demonstrated that the development of pneumonia before birth, or during the establishment of respiration, ought to be considered as a cause of non-viability, yet the physician could not conscientiously affirm that the infant had lived, since he was not in possession of incontestable evidence of it; moreover, it is very rare for pneumonia to drive out all the air contained in the lungs.

"If a small quantity of air be found in the lungs, and the attestation of witnesses is in favor of the life of the infant, the physician, before pronouncing upon its viability, ought to examine whether the signs of life spoken of are not analogous to those which we have already remarked as manifested in those infants where the respiration is incomplete and irregular; if such be the case, he must declare the infant not to have been viable, and that it had not been in full possession of independent life. Lastly, even when all the signs of independent life exist in an incontestable manner, it will still be necessary to be well assured that there is no congenital malformation, nor any serious lesion in any organ essential to life; thus, for example, an

infant may respire well, but if affected with an obliteration of the intestinal tube, must necessarily perish; consequently cannot be reputed viable.

"Death arising from congenital affections takes place at extremely variable periods; a non-viable infant may live eight, ten, or fifteen days, as we have seen in a subject where the heart was single, and that died fifteen days after birth; a child may also perish from a disease, the nature of which is not necessarily opposed to viability, on the day of birth, or the day after. Consequently the principle ought not to be laid down, as has been done by Professor Chaussier, that every infant attacked with a disease in the uterus, that dies within twenty-four hours after birth, whatever be the cause, should be reputed non-viable. (Chassier, *Mémoire medico-legal, adressé à M. le garde-dessceaux.*) Indeed, on the one hand, all diseases that are developed in the foetus in the womb, are not essentially mortal; and on the other, the diseases essentially mortal which the infant brings with it at birth, do not always cause death within twenty-four hours after birth.

"The indispensable conditions then of viability, considered with reference to the anatomy, physiology, and pathology of the foetus, are as follows:

"1. The child ought to be born at the full time. 2. No physical or pathological obstacle should exist adverse to the establishment of respiration and independent circulation. 3. When respiration and circulation are established, the body of the foetus should present no monstrosity, no congenital disease capable of causing death sooner or later. Now the examination of these particular lesions deserves especially to fix our attention, as by considering them we will be able often to cause truth to triumph, whether the question be to establish the fact that the child had not lived, or to demonstrate the contrary. In order properly to appreciate these lesions, it has appeared to me expedient to divide them into separate classes, according to their importance: the one being essentially mortal; others embarrassing the development of life, without being essentially a cause of non-viability; and the last offering no opposition to the establishment of life; thus, an infant born with an obliteration of the oesophagus, is not viable; another coming into the world with gastritis, or cutaneous phlegmasia, may live; another bringing with it a fracture of one of the limbs, or hare-lip, is unquestionably viable. This distinction is of the greatest importance; for those born with infirmities or diseases of the first order will admit of no discussion upon their viability; those of the second order may be extenuating circumstances in questions of infanticide; those of the third order can never be considered as causing non-viability.

"In order to render the data upon the question of viability more positive, it would be desirable that a commission of enlightened physicians should cause a view of congenital diseases, arranged according to the distinctions which have been advanced, to be drawn up; this

tabular view, founded on anatomical and pathological principles, might serve as a base to magistrates and physicians to judge the viability of an infant, when it is necessary to show the relative value of some congenital disease, in order to prove whether the child was viable or not.

"I have subjoined a table of this kind, which some one better qualified might correct with advantage, and which will not be considered of as much importance as if it were examined and discussed by a commission of intelligent physicians.

TABULAR VIEW OF CONGENITAL DISEASES, WHICH MAY BE CONSIDERED AS HAVING AN INFLUENCE ON THE QUESTION OF VIABILITY.

"I. *Congenital Malformations and Diseases Necessarily Mortal.*—Absence of the skin, with imperfection in the parietes of the splanchnic cavities. (Eventration.) Obliteration, division or duplication of the œsophagus. Ulcers and gelatinous softening developed in this organ before birth. Obliteration of the stomach. Its gelatinous softening developed before birth. Obliteration and division of the superior, middle, and a third part of the inferior portion of the digestive canal. General softening of the intestinal mucous membrane developed before birth. Dropsy of one or both kidneys. Coalition of the obliterated rectum with the bladder. Deformity of the nasal fossæ with monopsia. Hernia of the abdominal organs into the cavity of the thorax. Inflammation of the pleura, lungs, or bronchia, before or during birth. Impossibility of dilating the thoracic parietes, from extreme debility of the child. (Feebleness of birth.) Congestion of the heart and lungs at the time of birth. A single heart, or that consists of but one auricle and one ventricle. Division of the heart into two parts by a complete separation. Pericarditis developed during intra-uterine life. Acephalia. Anencephalia. Congenital malformation of the medulla spinalis. Hydrocephalus, with deformity of the cranium. Encephalocele, with hydrocephalia. Apoplexy, complicated or not with fracture of the cranium occurring before or at birth. Softening of the brain. Hydrorachis, with ulceration of the tumor.

"II. *Congenital Malformations and Diseases which, Without Being Necessarily Mortal, may be Adverse to the Establishment of Independent Life.*—Ecchymoses, contusions, sanguineous tumors, and cyanopothia. Nævi materni very much developed. Cutaneous inflammations. Adhesion of the lips. Inordinate length of the tongue. Extreme narrowness of the œsophagus. Simple œsophagitis. Follicular ulcers in the stomach. Simple strictures of the intestines. Imperforation of the anus. Intestinal haemorrhage. Calculous nephritis. Peritonitis, with or without dropsy. Congenital malformation, or depression of the thoracic parietes. Communication to a greater or less extent of the auricles or ventricles of the heart. Hydrocephalia but little advanced, and without a separation of the bones of the cranium. Imperforation and absence of the vagina. Accumulation of mucus in the bronchi.

III. Congenital Malformations and Diseases not Adverse to Viability.
—Simple absence of the skin. Cutaneous excrescences. Excessive development of the pilous system. Albinism. Stationary nævi materni. Hare-lip. Division of the velum. Deviation of the stomach, transposition of the abdominal viscera. Absence of one of the kidneys. Hypospadias. Extroversion of the bladder. Umbilical and inguinal hernia. Transposition of the heart. Stricture of its orifices, anomalies of the valves. Persistance of the foetal openings for some days after birth. Cerebral atrophy. Hydrorachis, without ulceration of the tumor. Fractures, luxations, and divisions of the limbs.

"If this tabular view were discussed and properly digested by physicians, and sanctioned by law, it would be desirable to establish the following rules relative to viability considered with reference to the pathology of new-born children :

"1. No child shall be considered viable that, having respiration, is affected with a disease mentioned in the first order.

"2. Every child born with a disease comprised in the second order shall be considered as viable, but affected with a lesion that embarrasses life.

"3. Every child, having respiration, that is affected solely with a disease indicated in the third order, shall in every instance be considered viable.

"There is much observation and close reflection in Billard's medico-legal inductions, and are, in the estimation of Dr. Francis "to be ranked among the best grounded in the science of physiology and pathology. The many volumes which have been written on the docimasia pulmonum since the celebrated essay by Dr. William Hunter, render it unnecessary to enlarge at any extent on this perplexing subject. The test of Dr. Hunter concerning the floating of the lungs of the child who has respiration, and the vast inferences which have hence been deduced from these circumstances, are not at the present day considered so conclusive as they were estimated at an earlier period in medico-legal studies. Though Swammerdam and Haller, as well as Hunter and other high authorities, affirmed that a single respiration would cause the lungs to float, yet the obstetrical practitioner is aware that children occasionally do not breathe until they are born for some time; that respiration itself does not uniformly dilate the lungs, and that they are in some instances so feebly or partially dilated by imperfect breathing, as nevertheless to sink in water. Nor need we marvel at these phenomena, the fact being well recognized, that an ordinary inspiration dilates, but in part, the entire pulmonary lobules, even in the normal condition of the organs. These, and many other facts of an indubitable nature, have rendered the hydrostatic test upon which so much reliance was once placed delusive. I lately witnessed a case of premature delivery, at the period of seven months gestation, in which the child manifested feeble respiration somewhat over two hours, when life no longer being

apparent, the lungs were subjected to the hydrostatic test of Hunter; and, though the lungs were minutely divided into small portions, yet each portion sank in pure water: this instance, indeed, occurred to the lungs of a seventh month child, but I might here record the particulars of several examples occurring with the lungs of children born at the full time, and with a like result. Schenkius, and also Bernt and others, have observed the same result of the inability of the lungs to float, though cut into pieces, even when taken from the infant born at the mature period, and who had lived one, or even two days.

"I purposely avoid detailing the several states of diseased or congested lungs in infants, which might entirely defeat the validity of the test of Hunter; nor need I dwell upon the practical inference which may be deduced from the occurrence that the child will occasionally enjoy a fair respiration upon the protrusion of the head, while the shoulders are locked in; and in such case can be wedged beyond the possibility of the natural efforts effecting its complete birth. Moreover, Professor Osiander, on the respiration of the foetus, has given us important facts touching the vagitus respiration, and vitality of the human foetus during and immediately after parturition; from which it may be safely inferred that in twelve cases at least, under his own observation, the child breathed and cried after the head was born, while its entire and safe birth was nevertheless subjected to various contingencies.

"Next to the hydrostatic test of Hunter, the *nova docimasia* of Ploucquet deserves a passing remark: and a rigid inference from facts compels us to say that the observations which Jaeger has made as to the relative proportions of the lungs and the body of the child, whether male or female, and the difference in the nutrient or vascular capabilities of different individuals in thoracic development all present conclusive reasons why this test, once thought so beautiful and so legitimate, is still not safely to be admitted as furnishing correct conclusions on so vexed a subject as infanticide. The most conspicuous writers on medical jurisprudence abroad, as well as some of our own country, have given us the results of their investigations on this test in so convincing a manner, that I shall terminate these reflections on the docimasia pulmonum with a quotation:

"The hydrostatic test of the lungs, though so ably maintained by Dr. Hunter, has not, I think, advanced in estimation by the latest facts concerning the docimasia pulmonum; while I am disposed to yield my conviction that the test of Ploucquet, founded on the absolute weight of the lungs, deserves much higher consideration than it has usually received. I am led to this opinion from the many opportunities of actual observation on the subject which have occurred to me during a period of ten years, chiefly as medical witness and adviser in the criminal courts of the city of New York. The positive evidence which seems to be afforded by the fact that the infant had breathed and lived after its birth, because of the lungs being capable of floating in water, and the reverse of the case, that their incapacity to float in

water is proof that the infant was born dead, are invalidated by numerous experiments of several pathological observers; and although the lungs afford proof of respiration, it is no evidence that the infant was born alive. Hunter yields this circumstance, and the occurrence has repeatedly fallen under the notice of accoucheurs. We must ever bear in recollection that respiration is a gradual process; that its first efforts are imperfect, and there is a remarkable difference in the time of its development in different infants, depending upon the greater or less degree of vigor with which the infant is endowed. Schmitt states, that he has seen the whole thoracic cavity occupied in infants who had not respired; while in the infants who had respired for thirty-six hours, the lungs were so little distended that one could scarcely find them, though they were filled with air. At the trial of a young woman for child murder, at the Warwick assizes, England, which took place some few years ago, this defence, which proved successful, rested upon the principle that the human foetus may respire as soon as the head is expelled in delivery. The medical witness expressed himself most anxious that 'the minds of the jury should be duly impressed with the important truth that a child may breathe and even cry audibly as soon as the head is delivered, and yet subsequently perish before the whole body is expelled.' See London *Medical Repository*, vol. xi.

"The emphysematous state of the lungs produced in cases where the child has been suffocated or strangled after birth, deserves to be specially noticed, as well as the peculiar appearances of the lungs, which depend upon air generated by decomposition. But the tardiness of the lungs to run into putrefaction, is a fact familiar to every pathologist and every student in a dissecting room. Billard examined a child in a state of such putrefaction that its sex could not be discriminated, and the muscles of its face were reduced to a pulp, yet did its lungs sink. I have on several occasions witnessed an equal degree of decomposition in infant bodies whose lungs bore not the least evidence of putrescence by the hydrostatic test. In further corroboration, the following quotation is taken from Camper: 'In order to ascertain to what degree putrefaction would advance in an infant before its lungs would float in water, I made different experiments at Amsterdam on this subject; and I have found that in those who had died before birth the head may be so far decomposed by putrefaction that the slightest force was sufficient to detach the bones from each other, as well as those of the arms and legs, before the lungs, which now began to participate in the putrefaction would float in water.'

"Rare as cases of diseased lungs are in infants newly born, the instances are nevertheless sufficient to cause us to conduct investigations of this nature with the greatest circumspection. By inflammation we know the lungs acquire additional specific gravity, and hence might sink. In the instance of a child who maintained a sickly existence and died on the morning of the third day after its birth, I

witnessed the sinking of the lungs from a morbid congestion, resembling hepatization. Other conditions of the lungs of infants have been seen, as a tuberculous state. Hence the necessity, when we employ the hydrostatic test, of dividing the lungs and experimenting with them in portions. But I am not now discussing the merits of the hydrostatic test;—my present intention is to record some additional testimony in behalf of the knowledge derived from the *nova docimasia* of Ploucquet.

" It appears that the changes effected by respiration in the lungs show that these organs undergo a great alteration in their specific gravity by this function: respiration is accompanied with an increase of the flow of blood to the lungs; hence the pulmonary arteries become dilated, and their ramifications, thus surcharged, augment the volume of the lungs. This change may be deemed permanent: by the increased capacity of the vessels, a larger quantity of blood remains after death, and the real weight of the lungs is increased. This pathological truth was noticed by Ploucquet as early as the year 1777, and is given in his *Commentarius Medicus*, printed in 1786. It would appear, from the observations of Ploucquet, that the weight of the lungs of a full grown fetus which had never respiration, is, to that of its whole body, as 1 to 70; while in new-born infants, after respiration had been established, it was increased as 2 to 70, or as 1 to 35. The experiments, however, on which these deductions are founded, are but few in number: in one case, where the new-born child had not respiration, Ploucquet found the lungs as 1 to 67. In another case of a mature fetus, which never breathed, the lungs, in comparison of the body, were as 1 to 70; and in another, where the child was not quite perfect, but had breathed, he found the lungs as 2 to 70. From these few facts, he says: '*Videmus exinde, pondus pulmonum ab accedente per respirationem sanguine, et post mortem iis adhuc inherentem duplicari audeoque, in casibus, dubiis hanc normam esse, ope cuius de facta, vel non facta respiratione judicare possimus.*' (Comment. Med. in Proces. Crim., p. 280.)

" Dr. Hutchinson has offered several arguments and facts which tend to disparage the importance of Ploucquet's test; and Haartmann has stated that he has not found the relation of the weight of the body to that of the lungs, even nearly similar to that mentioned by Ploucquet. Haartmann gives about 48 to 1 as the proportion after respiration has been effected, and about 59 to 1 as that existing before respiration. Struve states that he has found no constant relation between the weight of the lungs and the body under these circumstances; and to these authorities we may add Schmitt. That there is great diversity in the results of experiments on this subject, will be readily admitted; and no stronger proof of it need be given than that drawn from the examinations of Lecieux, of the *Hospice de la Maternite*, at Paris. I shall here give the results of a series of experiments undertaken, as occasions presented to me, for the purpose of ascertaining in the most satisfactory manner the truth.

"In case one, where it was sufficiently evident that the child had not been born alive, the proportion between the weight of the lungs and the whole body was as 1 to 47. In case two, of a foetus at full five months, the proportion between the lungs and the whole body was as 1 to 29. In case three, of a foetus nearly six months, the proportion was as 1 to 39. In case four, where the child was stillborn, (weight five pounds eleven ounces), the proportion was as 1 to 52. In case five, of a foetus, weight two pounds five ounces, the proportion was as 1 to 40. In case six, of an abortion at the latter part of the sixth month's pregnancy, the proportion was as 1 to 39 5-7. In case seven, of an abortion at the end of five months' gestation, the proportion was as 1 to 46. In case eight, of an early abortion, time accidentally omitted, the proportion was as 1 to 41. In case nine, an early abortion, the proportion between the lungs and the body was as 1 to 27. In case ten, of a child which had for a few moments respired, the proportion was as 1 to 36. In case eleven, of premature delivery at about the eighth month, and where the respiration had been established, the proportion was as 1 to 32. In case twelve, of premature delivery at seven months, and in which the child breathed feebly for two hours, the relative proportion of the weight of the lungs to that of the entire body was as 1 to 43. In case thirteen, an abortion at seven and a half months, the child possessing imperfect respiration some forty minutes, the proportion was as 1 to 43. In case fourteen, in which the child was stillborn at the full time, the proportion was as 1 to 66. In case fifteen, an instance of birth at eight months and a half, the child effecting some few imperfect respirations, the lungs were to the body as 1 to 40.

"From these results, I am led to give an opinion that the test of Ploucquet ought to be better known in our criminal courts, and that our jurists might profitably avail themselves of its principles. It will materially aid in the deficiencies of the hydrostatic test of Hunter. But to render the test less uncertain, we ought to know more precisely the relatively proportion between the weight of the lungs and the body of the foetus at different periods of gestation. The celebrated Orfila instituted a series of experiments for the purpose of calculating the relative weight of the lungs, not only as respects the entire body, but as respects the heart; and he frankly acknowledged the impossibility of drawing therefrom any positive inference. The proposed modification of Ploucquet's test, by Daniel and Brent, are less available for practical purposes than the test of Ploucquet." (Dennan Midwifery.)

AGE OF FATAL VIABILITY.

"There is another point of inquiry which I believe has scarcely been adverted to by Mons. Billard. I allude to the particular period of gestation at which the viability of the foetus, or its capability of supporting extra-uterine life, may be presumed. I recollect the case recorded by Dr. Rodman (*Edinburgh Medical and Surgical Journal,*) of

his patient having been delivered at the end of the nineteenth week of pregnancy : to this case I was originally referred by my late colleague in the university, Prof. Wright Post as among the best attested instances recorded of extra-uterine life at so early a period ; and such I believe it still stands ; though some controversy has arisen as to the correctness of Dr. Rodman's reasoning ; the feebleness and size of the child being uncertain data by which to arrive at a positive conclusion : and further, too, as Mr. Baker has subsequently published the case of a child born at the full period of utero-gestation, which corresponded in size very closely with the one made known by Dr. Rodman. I am the more inclined to confide in the accuracy of Dr. Rodman's statement from having seen a remarkable instance of a similar kind. In October, 1838, I was requested to meet in consultation in a case of retained placenta ; the patient, from fatiguing exertions, had been prematurely seized with labor pains, and, after unavailing measures of prevention, was delivered in the twentieth week of gestation, of a male foetus, which by distinct respirations sustained life one hour. After death it was found to weigh one pound six drachms : its length was ten inches, and it was well formed. Too many circumstances conspired to render the age of the foetus doubtful ; it was the product of a first conception, and the parties were beyond suspicion.

" My friend Dr. Wm. Barrow favored me several years ago with a foetus which was spontaneously protruded before the seventh and eighth month of gestation, the weight of which was little more than five ounces. The cause of so extraordinarily immature and limited growth at this advanced period, was ascertained to be a disordered condition of the cord, which impaired the foetal circulation. I give this case because it is calculated to lead us, in all inquiries of this nature, where we might conclude too hastily as to the age of the foetus by its bulk alone, to advert to the condition of the cord ; inasmuch as an abnormal formation of this connecting link between mother and child, as well as the sound or disordered development of the placenta, must exercise a controlling influence on the vascular energies, and more or less circumscribe the growth and dimensions of the foetus. There is much that might be said on this subject, and in Cruvelhier we find a number of observations illustrative of the various causes which disturb that functional reciprocity which in the pregnant state is indispensable to the sound and full formation of the uterine product. It is worthy of remark that in the case published by Dr. Rodman no notice is taken of any peculiarity in the cord, and in that which I have given its healthy structure was obvious.

" I will add another case illustrative of the early period at which extra-uterine life may occur, and in which the viability has secured the subject now some seven years. Mrs. B—— had been delivered after protracted sufferings of a dead male child, at the ordinary term of a first pregnancy. Twenty months after, the inconveniences of a second pregnancy were so great that she was on several occasions threatened with abortion. Neglecting the precautions recommended

her, she had, during the prevalence of the Asiatic cholera in 1832, indulged in eating freely of Indian corn, which created much annoyance in the stomach and bowels, and in the opinion of several of her friends it was thought that this indulgence was the exciting cause of her premature labor. By one powerful effort the entire ovum was expelled. Arriving at this crisis, I had the whole immersed in a vessel of tepid water, and having rendered the mother more secure and comfortable by a bandage, forthwith ruptured the membranes, when to my surprise I perceived a foetus, apparently of some five months and upwards of growth. The cord was divided, and more than usual care taken with the child; a fillet or ribbon was applied round its head, which seemed unusually large, and the body wrapped in cotton. By unremitting attention on the part of a competent nurse, the fondest wishes of the parents were ultimately realized, and the daughter, in the enjoyment of excellent health, has, at the present writing, completed her seventh year. Subsequent inquiry with the parents concerned made the age of this premature offspring at birth, a foetus of the twenty-third week of pregnancy."—[Francis.]

HEREDITARY TRANSMISSIONS.

MATERNAL MANAGEMENT DURING THE PERIOD OF GESTATION.

The importance and gravity of this subject renders it one that should make the physician very careful as to his directions to each pregnant woman, for there are few medical practitioners who are not consulted as to the care which women ought to take of themselves during pregnancy, with regard to their own and their infant's welfare; and it is consequently most desirable that he should be able and anxious to give a few sensible directions. However highly a woman may have been educated, she unfortunately finds when she has no longer to live for herself alone, that her acquirements and accomplishments are of small service to her in the new duty which now devolves upon her.

The Diet should be simple, light, nutritious and adapted to the requirements of the individual and the condition of the digestive organs. There is often a craving in pregnancy for unusual articles of food. These may sometimes be allowed within certain limits, provided they are such as do not derange the stomach. Highly seasoned and rich food, as well as tea and coffee should only be used in moderation, and alcoholic stimulants are — to say the least — generally unnecessary. The fear of plethora so often referred to in the older works is perhaps an unnecessary one, although we do meet cases where there is plethora and in others oedema. These conditions are apt to jeopardize the life of both mother and child by predisposing to puerperal convulsions. The diet of such a mother should be chiefly solid food. *Aconite* and *Apis* are the remedies that are chiefly indicated in these conditions. A too spare diet is on the other hand, no less injurious and reprehensible. Unhappily, however, it is less easily avoided, and many of the wives of the laboring classes not only suffer much themselves from their inability to procure a due supply of wholesome food, but in consequence give birth to feeble and unhealthy children, who ultimately perish.

The direction of some would-be hygienists, to avoid the use of articles of food that aids the formation of bone, is a species of foeticide

that should be discountenanced. The plea that it will render labor easy, is akin to that of producing abortion "to save the *health* of the mother." My observation has been that difficult labor is not usually the result of ossified cranial bones, but rather from a large cerebrum, due to the excessive activity of the nervous system. The direction to live on ripe fruits, farinaceous food, etc., take sitz baths, etc., accomplishes the result by making the life of the mother more vegetative, therefore, both she and the child have more physical energy and less nervous developmental susceptibility. The child, must manifest less nervous activity and mental capacity. "Weaker and wiser" is the penalty of civilization. Still there is a judicious abstinence from mental activity and nerve food supply that should be directed.

The law of diet should be borne in mind, viz., to supply the lack of the system. If the woman is spare, every effort should be made to fatten her. Liquid food, as soups, milk, milk toast, oatmeal and milk, hot water with milk, starchy food, fat food, if it can be taken, and sweets, as well as quiet will tend to increase the vitality and vegetative, life of both mother and child.

When the opposite condition is met, the effort should be to prevent grossness, *i. e.*, to much connective tissue, which interferes with the normal development of the infant. It is well known that gross mothers are not good milkers. What is true after birth is also true before birth.

Clothing.—This should be warm and comfortable, especially avoiding tight bands, and the use of corsets. The breasts and the body particularly require to be secured from injurious compression, and the dress and undergarments should be so made that they may adapt themselves to the increasing size of those parts. Woolen drawers should be worn, in order that the abdomen which pushes out the dress, and the lower part of which may not be injuriously acted upon by the cold air. Delicate women, especially if they have long been accustomed to corsets, and if their abdominal muscles are relaxed, sometimes derive benefit and support from an elastic bandage or a broad flannel roller applied around the lower part of the body; it must not be tight, however. A woman carrying triplets found great relief from such a bandage, as the dragging on the abdominal muscles was very great. Where the circulation of the blood is languid, the lower extremities and feet will be cold, and will require to be protected by warm stockings and thick boots.

Cleanliness.—A tepid bath, every day or two will contribute greatly to the comfort of the pregnant woman. For those who are of spare habit, a sitz bath taken at first weekly, and then daily during the last month of gestation, will aid foetal growth and at the same time render labor more easy by relaxing the ligaments. The use of a flesh brush or coarse towel over the entire surface of the body will equalize the cutaneous circulation.

Exercise.—The pregnant women should not be made a captive, but should exercise in the open air, in all seasons, care being taken however that it is not carried to the extent of fatigue.

Walking, which is the best and gentlest means of taking exercise, should be indulged in daily. Riding on horseback, dancing, and other kinds of violent exertion should be forbidden. Constant activity as well as hard labor, lifting, etc., has a marked effect upon the vigor of the child. In one case I attended, the mother who worked hard was constantly active up to the hour of labor. She was delivered of a very small, feeble child, that was constantly ill. It died of a slight attack of capillary bronchitis. Another feeble child had this history. Mother did not want it; was very active; took no dinners; craved stimulants. Threatened with miscarriage at fifth month, consequently the child was very feeble.

She should never nurse the sick. The pregnant mother should have unbroken rest at night and no anxiety of mind during the day, so she can sleep easily and readily.

The Moral State.—The pregnant woman should avoid all causes of undue mental excitement. This is almost as necessary as the avoidance of physical exertion. There is during pregnancy an unusual susceptibility to mental impressions, and this should not only be borne in mind by the woman herself but by those who associate with her. Strong emotions whether of joy, sorrow, or anger, affect primarily the nervous system, but indirectly the most of the organs of the body. Observations have long established the fact that such emotions influence the state and functions not only of the digestive and glandular, but muscular organs, as the heart and uterus. Physicians are familiar with cases in which vivid mental impressions produced uterine contractions, and even miscarriage, or have disturbed the catamenial function. Therefore the associations and cares of pregnant women should be such as conduce to cheerfulness and equanimity. The condition of mind the mother should cultivate is that of easy self-control.

HEREDITARY TRANSMISSIONS ILLUSTRATED.

Vivid mental impressions sometimes have a direct effect on the development of the fœtus. Many cases are on record in which infants were born with so-called marks or deformities corresponding in character with objects, which had been seen and had made a strong impression on the maternal mind at some period of gestation. Whether the mind of the mother exerts a controlling influence on the form and color of the fœtus, is a subject of great interest to the psychologist, as well as physiologist and physician, since it involves no less a question than the power and scope of the human mind. Violent emotions it is admitted may affect directly the most important organs in the system. They may derange the liver, causing jaundice, accelerate, or for a moment suspend the heart's action, stimulate the kidneys, causing diuresis, or even the intestinal follicles, causing watery evacuations. But with all these organs the brain is connected by nerves which anatomy reveals. On the other hand, the mother and fœtus have a distinct existence as regards their nervous system, and even their blood.

Still the multitude of facts which have accumulated, justify the belief that deformity, or other abnormal development of the fœtus is, sometimes due to the emotions of the mother. Smith (*Diseases of Children*) relates the following : " An Irishwoman of strong emotions and superstitions, was passing along a street in the first months of her gestation, when she was accosted by a beggar, who raised her hand destitute of thumb and fingers, and in 'God's name' asked for alms. The woman passed on, but reflecting in whose name money was asked, felt she had committed a great sin in refusing assistance. She returned to the place where she had met the beggar, and on different days, but never afterwards saw her. Harrassed by the thought of her imaginary sin, so that for weeks, according to her statement, she was distressed by it, she approached her confinement. A female infant was born, otherwise perfect, but lacking the fingers and thumb of one hand. The deformed limb was on the same side, and it seemed to the mother to resemble precisely that of the beggar. In another case a very similar malformation was attributed by the mother of the child to an accident occurring to a near relative, which necessitated amputation, during the time of her gestation. Another instance, was that of an infant with a supernumerary thumb, whose mother, a baker's wife, gave the following history. No one of the family, and no ancestor to her knowledge, presented this deformity. In the early

months of her gestation, she sold bread from the counter, and nearly every day a child with a double thumb came in for a penny roll, presenting the penny between the thumb and the finger. After the third month she left the bakery, but the malformation was so impressed upon her mind, that she was not surprised to see it reproduced in her infant."

Bouchut (*Diseases of Children*) says: "There seems reason to believe, however, in the occasional origin of deformities in the foetus, from vivid external impressions acting through the imagination of the mother. Boerhaave, speaking of the causes of apoplexy, says that the tendency to this disease may be 'born with one from the imagination of the mother when she was pregnant, being shocked at the sight of a person in an epileptic fit.' Whitehead relates some cases in confirmation of this view. In one case which happened to him, the lady was in great dread in five successive pregnancies, of her children being born blind, on account of her sister's eldest child having had this congenital defect in the left eye. The result of these pregnancies is thus summarily stated: out 'of five children born at the full term of utero gestation, each as remarkable for plumpness and vigor as the mother is for a well developed frame and robust health, the first, third, and fifth of her children had defective development of the *left* eye, amounting in one to deformity; and the second and fourth had complete loss of vision of the same side.'"

A young woman in the sixth month of pregnancy, caught a full view of a double hare lip while under operation; she fainted, and at the full time of utero gestation was delivered of a well-grown female child, who had double hare lip and cleft palate, like the one she saw three months before. No such deformity had been previously known either in her family or in that of her husband. A lady in reduced circumstances, had borne four healthy children at full term. She possessed a robust constitution, and was descended of a healthy stock, both as regards body and mind. Her husband and his family had been similarly favored, but he, from being a faithful and affectionate companion, became dissipated and cruel. When five months advanced in her fifth pregnancy, the unkindness she received from her husband threw her into a state of great mental distress and despondency, during the prevalence of which she attempted to destroy herself by drowning, but was opportunely rescued. She was delivered at the full term of utero-gestation, of a boy, who survives, but also is completely imbecile. She then bore a female child, who also survives, and is perfectly healthy. She had then an abortion in the fourth month, and died nine months afterwards of malignant disease of the uterus.

Neither idiocy or malignant disease had been previously known in the family of either parent. A woman in strong mind, in competent circumstances thirty-two years of age, and in the seventh month of her sixth pregnancy, had occasion to visit the shop of a grocer, and while she was in the act of delivering her orders, a heavy weight fell upon the instep of her left foot. She was in great pain, and unable to walk was immediately carried home in a conveyance. Whilst sitting with the injured limb in a foot bath, she felt a sudden and violent struggle within her, followed on the instant by a plentiful escape of water, per vaginam, which was the liquor amnii. She was placed in bed, and a medical man sent for, who finding the pains of labor strong and frequent, and a foot of the foetus already low down, proceeded to deliver. The child (female) was puny, alive and apparently healthy. Its left foot which had been the first to present, was found to be firmly contracted towards the inner aspect of the limb, the heel being raised, and solei muscles rigid and unyielding. This state of parts continuing, the foot was forcibly brought into its natural position, and there maintained by means of a bandage, and thus its use and symmetry were eventually restored.

Broadhurst (*Medical Times and Gazette*, 1853), gives the following instance : "A woman during the sixth month of pregnancy suffered from sudden and intense fear; by a powerful muscular effort she saved her life. For four days after this occurrence she believed her child to be dead, as it remained motionless. After this time, however, it again began to be felt, and in a few days its movements were as distinct as before the accident. The child was born at the eighth month, with the most severe talipes varus and cheirismus."

The following is related by Baron Percy, as having occurred after the siege of Landau in 1793 : "In addition to a violent cannonading, which kept the women in a constant state of alarm, the arsenal blew up with a terrific explosion, which few could hear with unshaken nerves. Out of ninety-two children born in that district within a few months afterwards, sixteen died at the instant of birth, thirty-three languished from eight to ten months, and then died, eight became idiotic and died before the age of five years, and two came into the world with numerous fractures of the bones of the limbs, probably caused by irregular uterine contractions. A number of cases have been published in which malformations of the infant appeared directly traceable to strong impressions made on the mind of the mother some months previously to parturition; these impressions

having been persistent during the remaining period of pregnancy, and giving rise to a full expectation on the part of the mother that the child would be affected in the particular manner which actually occurred. For further observations upon this subject the reader is referred to Montgomery, On the signs of pregnancy, (see Congenital Affections). No soundly judging physiologist of the present day is likely to fall into the popular error of supposing that "marks" upon the infant are to be referred to some *transient* though strong impression upon the imagination of the mother; but there appear to be a sufficient number of facts on record to prove that *habitual* mental conditions on the part of the mother, *may* have influence enough at an early period of gestation, to produce evident bodily deformity, or peculiar tendencies of the mind.

The view here stated is one which ought to have great weight in making manifest the importance of the careful management of the health of the mother, both corporeal and mental, during the period of pregnancy, since the ultimate constitution of the offspring so much depends upon the influences then operating upon its most impressible structure. (Carpenter's Physiology).

From an interesting article on "First Causes of Structure and Character of the Embryo," read before the Western Academy of Homœopathy, by our venerable friend and scientific observer, O. P. Baer, M. D., of Richmond, Ind., (*U. S. Medical Investigator* No. 208, p. 151), the following is extracted as bearing directly upon this important subject:

MENTAL STATES TRANSMITTED.

CASE I. Mrs. G., has four children, and the youngest is now sixteen years of age. When the first child was begotten, she was comfortable and happy. She brought her husband, who was a poor man, ten thousand dollars, and placed it at his command, and while this lasted all did well. They flourished like green bay trees, at home and abroad. The first-born was a cheerful, lovable son; high in his aspirations, full of hope and bright anticipations. After this birth money fled apace, poverty soon followed, ushered in by tippling at wine bottles and card playing. In due time the second child a girl, was born, arrogant, petulant, quarrelsome, eccentric, and of low morals. Strife, contention, drunkenness, thievery, and all sorts of irregularities ensued, and the third child, another daughter, came — wayward, vulgar, loves the bottle and all manner of lewdness; and until nearly eight years of age, found it difficult to use even common words. Is passionate and violent, and has no inclination to improve herself in any way. The fourth and last child, a son, is quite idiotic,

and has the drunken swagger which was peculiar to his father; has but a very limited vocabulary, and is not qualified for any kind of business or mental improvement. This child, the mother assures me, was begotten during a prolonged drunken debauch. Here is a family, as a type of hundreds, that might be cited with a little perseverance.

CASE II. Mrs. D. has three children nearly grown, and all of them exceedingly peculiar. The oldest child is a girl, moodish, despondent, peevish, fretting, crying on all occasions, never satisfied; threatens her life, is secretive and destructive. When quite a young child, frequently killed kittens, pups, goslings, young chickens and such-like, just because she enjoyed the sport. She was begotten, as her mother has informed me, contrary to her wishes; she used every effort to destroy the embryo, and when she found that she could not succeed, she became very melancholy, desponding and retiring. She says she now sees in her daughter the very workings of her own mind, while carrying her. Here is a very common representation, leading, no doubt, to the present frequency of *suicides*. I never hear of a suicide but I wonder if the parent tried to effect abortion and failed; and harboring this murderous spirit to the end of gestation, brought forth a child with a like character, murderous, fiendish, quarrelsome, and combative. She was brutal to her playmates, her pets, and to her parents when corrected; often threatening to kill herself, or others, as provocation offered.

The mother became tinctured with the prevalent doctrine of women's rights, and her husband became her determined opponent in all such irreligious proceedings; and in consequence of their radical differences, a divorce was strongly threatened. But as in all differences between man and wife, pleasurable moments occurred, when, unexpectedly to the wife, she conceived the second time. She desired relief from her burden, but having failed before, after a severe ordeal well-nigh costing her her life, and the doctor informing her that to effect a miscarriage upon her would be death to her, she put on the air of reckless indifference, and played the "*hauteur*" most effectually. Took her husband to task on all occasions, and flirted with other men to disturb his equanimity. Her gestation ended, another daughter came forth, reflecting the very likeness of her mother's conduct, in almost every particular. She plays the coquette at one time, and *hauteur* at another. She is a real mystery to herself and every body else.

The parties became ashamed of their works, and resolved to do better; or, in other words, became one in feeling and action: ceased being merely conjugal partners, and sought light from within and above themselves, and became more intimately conjoined—*conjugal*.

The third child came, a son, as bright as the morning, full of goodness, love and truth; a real Godsend to the family. You cannot behold the young lad but to love him, admire his ready wit and easy manners, really destined to be an honor to his parents and his country.

CASE III. Mrs. J., while pregnant, was constantly hankering after

spirituous liquors ; but her husband, being a firm temperance man, persuaded her to use lemonade and such-like, which she did, without relief ; and to her grief be it said, the boy, now some ten years old, is irrepressibly fond of whisky and all other alcoholic drinks. Before he was six months old, would drink whisky as if it were water ; has already been drunk twice.

CASE IV. Mrs. W. has a daughter whose fingers are very much prone to kleptomania. Although the family are well to do, yet the child has an irresistible desire to steal every thing pretty. Her mother felt the same desires while carrying her ; and often took little things because they were symmetrical and pretty.

Physicians often notice children born with very large and projecting cerebellums, and at the same time, very small, receding, smooth cerebrums. These are objective results of the mother's state while forming the foetus and go very far to prove her want of mental advancement during the period of gestation, and, to my mind, proves most conclusively that her temporal, household, manual obligations were the prevailing topics of her thoughts and actions. Then, again, he will find cases where the cerebrum is well developed, prominent, and both the reflective and perceptive faculties protuberant, with a longer fiber than that of the cerebellum. Here, the mother has evidently been among her books, or gaining knowledge from lectures, conversation, or other modes of mental culture. The child's development is markedly in correspondence with its mother's retrograde or progressive states. The mother is the store-house for the foetus, both physically and mentally ; and the embryo is the recipient of all that the mother has to spare. Localities, distances, substances, heights, depths, animals, life, death, Deity, each may be impressed upon the mind of the embryo, though vaguely, yet ineffaceably. Let all physicians make this phase of human life as much of a study as I have done, and surely great light will shine upon what we now see and comprehend but darkly. I hold it as a moral and Christian duty for the physician, as a philanthropist to his race, to instruct all young married partners how to beget their offspring, that they may improve the race and not retrograde it.

PHYSICAL STATES TRANSMITTED.

Having considered the first causes of character, the first inklings of ideation in utero, let us glance for a moment at a few abnormal developments of structure in utero. During nearly thirty-eight years of active professional duties, particularly among ladies, I have met with scores of abnormalities, both in my own practice and among others. And in every deformity of the embryo, the mother has always been prompt in giving the direct cause of it.

CASE V. Mrs. Z., at her second birth, brought forth a child weighing seven pounds, presenting a most terrible sight. Directly below the occipital protuberance and over the atlas, was an open *wound*, at least one inch wide, and two and one-half inches in length, extend-

ing transversely ; showing portions of both first and second vertebrae, presenting the appearance of the head half chopped off. The eyes were singularly rolled up, and the mouth wide open and crooked upward, while the hands were spread, slightly webbed. The child lived but a few moments and expired, much to the comfort of all concerned. Now the ante-type in this case, was a large Norway rat. The father was sharpening some fence pickets with a hatchet, on the back doorstep, when a large rat ran out from under the step, and Mr. Z. having the hatchet raised at the same time, instantly struck the animal instead of the picket, just as the wife approached the door ; and she, thus greatly startled, became fixed to the spot, and beheld the death agonies of the fatally wounded rat. This transaction occurred when *ten weeks* pregnant, and this mutilated animal worried her mind the remaining entire time of gestation. The impression was ultimated in the child, in perfect imagery of the sight.

CASE VI. Mrs. T., with third child, when three months gone, was one afternoon crossing the commons just opposite her dwelling, when an old, ugly-looking ox chased her most furiously to within a few steps of her yard gate, where he accidentally struck a rail, fell, and broke off his left horn. She entered the gate, and turned to behold her enemy lying prostrate, with one horn hanging down over his left eye, and he unable to rise. This transaction preyed upon her constantly, notwithstanding her zealous efforts to cast it off. The child was born with two horns proceeding out of the organs of causality, phrenologically speaking, and were about one and one-half inches long. The one on the right side stood out horizontally, with some divergency, while the left fell directly down over the eye. The eyes were bloodshot and staring, with a very low, receding, hairy forehead. These horns were not protuberances of the frontal bone, but came out from within, apparently independent of the external bone. This child lived thirty-six hours and died, with a protruded, convulsive tongue.

CASE VII. Mrs. N., a lively, cheerful lady, full of fun, and never loses an opportunity of playing tricks upon her intimates. On one occasion, while pic-nicing on the river's edge, some one of her numerous friends, upon whom she had played jokes repeatedly, threw a struggling, half-famished catfish into her lap, while sitting upon the grass. She jumped and screamed, terror-stricken, as the poor fish caught in her clothes and hung to her, which served to prolong her fright, and finally brought on a severe spasm. Abortion was threatened, but failed. She went on to the end, feeble and anxious, fearful of suffering and death. This trouble occurred during the *second* month. The monstrosity came, weighing four and one-half pounds. Its head was evidently human in aspect, though the jaws were much elongated, and the eyes were set up most prominently upon the top of the head, the forearms and hands were short, and spread out fan-like ; the body was smooth, with a sharp spine, and blunt protuberances

on either side, near the pelvis; and what should have been legs, was flattened and presented the rudiments of a double fan-tail—in constant motion, with general tremors, short breath, and screaming. Died on the fifth day from starvation, as it refused all food. Seemed frightened at everything.

CASE VIII. Mrs. P. gave birth to a large, healthy anomaly in the form of a human alligator. Jaws long and robust, arms and legs short and webbed; body long and rather slender, with a long, tapering tail, which she whips about with much force. When I last saw her, she was eighteen years old. Was kept in close confinement, so much so that not even their nearest neighbors knew any thing of it. She manifested no rationality whatever, and could not talk or articulate the simplest word, neither could she be educated to remember the most trifling thing. She made a singular grunting noise as she crawled around the room, and was very noisy when hungry, and ate quite greedily. Would wear no clothes, and was rather filthy than otherwise. The cause of this deformity was her mother's fright at an alligator, on the Florida coast, when she was about six weeks pregnant. She, with many others, was making a little pleasure tour, and becoming tired from a long walk, sought a place to sit down, and seeing, as she supposed, a good sized dry log, she hastily approached it, and just as she was in the act of seating herself, one of the company espied the apparent log to be a huge old alligator, and hallooed at her, with all her might to run away as she was in danger. She sprang away, and on looking back, beheld the rough old monster slowly moving towards the water, having been disturbed from his afternoon slumbers. The animal, in its innocence, unconsciously and unintentionally wrought a terrible work, by repeating its permanent image on the human species.

CASE IX. Mrs. H., hunting pea-sticks, when she was about *seven weeks* pregnant, approached a pile of brush, commenced demolishing it, and making her selection of sticks. Suddenly she heard a hissing noise, and looking closely beheld several black snakes coiled up in a heap, and seemingly much disturbed. She made a hasty backward retreat, followed by a large spotted lizard, which, no doubt, was driven out of the brush heap by her son throwing a stone into it. She screamed, fainted, and fell; and on her recovery, hunted for the lizard among her clothes, but did not find it. Went home, sent for her husband, and then removed her clothes, and found the lizard nicely ensconced in the folds of her *bustle*. The fright was a terrible one, and told seriously upon her throughout her entire pregnancy. And the result was a well-developed monster of the lizard type, of a smooth though mottled skin. Shape of head, limbs, and caudal appendage were decidedly reptilian. I informed the mother, as the head was being born, that a monstrosity was coming, whereupon she begged me to kill it; but the father called out from the adjoining room, "Doctor, save its life! It will be a fortune to me and mine." I told the mother I would cut the cord *close*, and not tie it, as many doctors

were doing now-a-days, and let it take its chances for life. It died in about two hours.

CASE X. Mrs. B., a farmer's wife, went one fine morning to milk the cows in the field, just back of her barn, and observed one of her pet ewes, making repeated efforts to rise from a recumbent position, and as often falling back again. She stepped to her to learn the difficulty, and lo ! her abdomen was torn open from sternum to pelvis, with the greater portion of her bowels hanging out, presenting a sickening sight to behold. The result of this adventure, at her *tenth week* of pregnancy, was a deformed child, with the great mass of its intestines hanging from the body, in bulk fully as large as the babe's head ; and out of the centre of this intestinal mass issued the funis, greatly enlarged, so much so that I could not cut it within one foot of the body. This child lived three days, and died from a spontaneous rupture of the umbilical tissue. The mother says it looked just as the poor sheep did, and its actions in many respects, resembled those of the mutilated beast.

This tableau of physical transmissions upon the embryo in utero might be prolonged indefinitely ; particularly of nevi, moles, discolourations, natal teeth, supernumerary fingers and toes, closed nostrils, hair-lips with cleft palates ; closed anus, vagina, urinary duct, and prepuce. I have seen all these cases, and others not here hinted at ; all traceable to some distinctive, efficient cause. But my purpose in writing this article is accomplished—that of throwing out some very practical suggestions in relation to the first causes of structure and character ; and the means of promoting the future good of the human race. Before this age of rationality, mankind were too superstitious to heed any practical suggestions on this most sacred of all subjects. We are fully able to bear it now, and profit by the lessons deduced from experience and common sense. To the medical profession, far more than to the religious teachers, belongs this important mission of philanthropy. Can we not post each newly-married pair how to beget the very best of children ; how to avoid imbecility, and idiocy, together with every other impropriety and defect in their offspring, both mentally and physically ?

ACCIDENTS INCIDENT TO BIRTH.

We have hitherto considered the foetus, with the disorders and diseases of its development. We now come to the ripening and delivery of this human fruit, and the accidents incident thereto. About one-tenth of all the children born, are premature or still-births.

One of the accidents that is apt to jeopardize the health of the child, if not its life, is premature delivery. The causes of premature delivery are many, viz.: Falls, blows upon the abdomen, ill-health of the mother, fatty placenta, strangulation of the cord, constitutional diseases, etc. A child may be born either prematurely or at full period, and not survive its birth, owing to the natural feebleness of system. This is observed among immature children; and it is a condition especially dwelt upon by Dr. Hunter. A full consideration of it will be found elsewhere. Such children may continue in existence for several hours, breathing feebly, and may then die from mere weakness. These cases may be recognized by the immature condition of the body, and the appearance of general want of development.

Hæmorrhages from laceration of the cord is apt to result seriously if not fatally, to the child. Premature separation of the placenta is likely to jeopardize the life of the child. During delivery the cord may be accidentally ruptured, and the child breathe, but still, from the great loss of blood, death finally result.

Compression of the cord is another accident that may happen, and hazard both the health and life of the child. The cord may be pressed between the presenting part and the body of the mother; or it may be twisted about the neck of the child, and thus partial strangulation ensue. Another accident incident to birth, is the non-establishment of respiration, which may arise from an accumulation of mucus in the nares and fauces; or the epiglottis may adhere to the glottis to such an extent that it must be raised by the finger in order that air may gain admission to the larynx.

Descent of the cord — this accident, fortunately, is a rare one, but is a very serious complication when it does take place, as the suspension of its functions by pressure, produces asphyxia, speedily followed by the death of the foetus. It is most apt to take place when the

membranes are ruptured, and the funis descends rapidly with the gush of waters, into the vagina, or even externally.

Malpresentations, by the delay they occasion, or the mechanical procedures that have to be instituted, may result seriously, if not disastrously to the infant.

Multiple pregnancies, especially where there are triplets or more, are attended by a high degree of fatality to the children born, due chiefly to imperfect development and premature delivery.

Deformities of the maternal pelvis, by which natural delivery is rendered impossible, is another source of accident that may befall the child.

Delivery by the forceps, although generally attended by the most favorable results, may in inexperienced hands be made the occasion of much mischief, *e. g.*, traumatic lesions, fracture of bones, dislocations, etc.

Too rapid delivery, by detaching the placenta from the uterine surface, is another accident that may cause the death of the child from loss of blood before respiration has been fully established.

Rigidity of the maternal perineum may be followed by the most serious consequences, as, the vagina having become greatly elongated, it may rupture, haemorrhage ensue, and the child not unfrequently escaping into the cavity of the abdomen. The foetal head, after passing the mouth of the os uteri, may be firmly embraced by it. This is an occurrence fraught with great danger to the life of the child, especially if the umbilical cord is twined around its neck.

The administration of *Ergot* in large doses to the mother, may be fatal to her offspring by too rapid delivery, as heretofore described, or by poisoning the child jeopardize its health and life. So great is the mortality of children, delivered by midwives in Germany, that the use of *Ergot* by them is prohibited by government.

Rupture of the uterus, in which the foetus passes into the peritoneal cavity, is almost necessarily fatal to the child.

Infants that are monstrosities, and those possessing malformations that are incompatible with life, exist for a variable period, from a few hours to a week, or even longer. Such cases are notably deficient in vitality, in addition to the peculiar deformity which marks each separate child. They rarely survive delivery. In this connection it may be well to state, that the prevalent opinion that considers it a duty to destroy these monstrous births has no authority either in law or medicine; on the contrary, such an act is held to be *manslaughter*, and the perpetrator made accountable.

The use of anaesthetics, when they are prolonged, may so profoundly affect the infant as to render it feeble.

Rigidity of the os gives rise to dangers to the child from the inordinate and continued pressure to which it is exposed. The placental circulation will be disturbed and congestions, asphyxia, and not unfrequently the death of the foetus results. Puerperal convulsions jeopardize the life of the infant. Dr. Merriman states that out of fifty-one births, thirty-four were still-born — about 66 per cent.

The cord may be so tightly twisted upon itself, or even knotted, as to affect the health if not the life of the child. Pressure upon the uterus by lacing, faecal or gaseous accumulations, etc., may injure the child, and in some cases effect its premature delivery.

The use of purgatives, such as *Podophyllum*, *Aloes*, *Calomel*, etc., may cause the death of the foetus.

Local diseases of the uterus, or any of its appendages, are liable to jeopardize the life of the child, and the same are true of constitutional diseases, especially either of the specific diseases.

The large mortality under the head of "premature and still-births," show that the perils of child-birth are great. Some of these may be avoided by judicious management and skillful treatment, but others are beyond the power of control. A full knowledge of all the dangers is frequently sufficient, however, to make us masters of the situation.

CHANGES AT BIRTH.

Before we can properly understand the abnormal conditions incident to birth, we should be familiar with the normal changes thereof. The first act of the new-born is to inspire. Immediately after birth the muscles of inspiration contract, and the air finds its way for the first time into the pulmonary vesicles. Some authors think this act is a reflex one from the irritation of the air upon the skin, causing a spasmodic action of the muscles of the chest. This may be true to a certain extent as the transition of the new-born infant from a temperature of 98° or 100° to one of 65° or 70° is no doubt accompanied by a considerable shock to the cutaneous nerves, but upon close observation, we will find that respiration is really being established before complete delivery takes place, by the air penetrating the nasal passages as soon as the head is born, which is shown by the snuffling sounds made by the infant; the deep inspiration and full cry comes only after full delivery. This view receives additional support from the few instances in which the child has been heard to make indistinct sounds while yet in the maternal passage, shortly before extrusion.

CHANGES IN THE VASCULAR SYSTEM AT BIRTH.

After the connection with the mother has been severed, the physiological changes that take place in the new-born are well described by Vogel in detail as follows:

Respiration and Circulation.—The increase in volume of the lungs consequent upon the establishment of respiration gives rise on the one hand to an outward enlargement of the thorax, but on the other to a compression of those internal organs of the chest in juxtaposition with the lungs *i. e.*, heart, large blood vessels, and thymus gland, and also to a depression of the diaphragm, whereby a palpable pressure is necessarily exerted upon the abdominal viscera. This sudden change in volume of both thoracic and abdominal viscera, in connection with other physiological alterations, leads doubtless to alterations in the circulation of the different organs, and the following foetal circulation, in fact becomes established immediately or soon after birth.

The Ductus Venosus Arantii.—The umbilical vein arising from the placenta after its entrance through the umbilical ring, runs

between the peritoneum and transversalis muscle to the liver, and through the fossa longitudinalis anterior sinistra to the left end of the fossa transversa. Here it divides into two branches, of which one, the larger, communicates with the portal vein, and the smaller, the *ductus venosus arantii*, leads into the inferior vena cava. The *ductus venosus arantii*, therefore, connects the vena cava ascendens with the umbilical vein, as well as that with the portal vein, ceases as soon as the placenta is expelled from the uterus, and the blood in the umbilical vein has become stagnant and the first inspiration has taken place.

The *umbilical vein* and *ductus venosus* become completely obliterated between the second and fifth days after birth, and ultimately dwindle to fibrous cords; the former becoming the round ligament of the liver, the latter, the fibrous cord, which, in the adult, may be traced along the fissure of the *ductus venosus*.

The *Ductus Arteriosus Botallii* is in the foetus a communicating canal between the pulmonary artery and the aorta. It arises at the point where the pulmonary artery divides into the two branches, then runs obliquely upward toward the lower border of the arch of the aorta and joins the latter at a point opposite to where the left subclavian artery dips into it from above. It serves to arrest the blood in its course toward the lungs, and to conduct it from the right side of the heart directly into the great current again. The nearer the end of gestation arrives, the smaller this artery becomes, while the two branches of the pulmonary artery grow larger. The broader however this vessel is, so much the narrower is that portion of the aorta which lies between it and the heart. And now the lungs, dilated by the inspiratory muscles; not only draw in air, but also blood from the vessels; not only the air vessels, but also the blood conducting system of vessels become distended. A stronger and faster blood current passes from the pulmonary artery toward the lungs; the artery sends no more blood through the foetal passage communicating with the aorta (*the ductus Botallii*), and the latter is so quickly obliterated that in a child twenty-four to thirty-six hours old, it is scarcely large enough to admit a probe.

The *ductus arteriosus* begins to contract immediately after respiration is established, becomes completely closed from the fourth to the tenth day, and ultimately degenerates into an impervious cord, which serves to connect the left pulmonary artery to the concavity of the arch of the aorta.

The Foramen Ovale.—In the foetus the auricular septum contains an

opening (foramen ovale) corresponding to the fossa ovalis in the adult. In this opening a semi-lunar membranous valve (valvula foramenis ovalis); is found, the upper border of which is free. In the foetus this valve closes the foramen very imperfectly, so that a portion of the blood passes directly from the right into the left auricle, and thence without permeating the lungs into the general circulation. The nearer the end of gestation arrives, therefore, the smaller this foramen becomes, and the stronger and firmer the valve. After birth the lungs are converted into a suction apparatus, they therefore require a larger quantity of blood for their supply; the right ventricle also becomes distended, and thus the blood stream is diverted from the foramen ovale. Although the border of the valve usually remains free for some months, still it is so well developed that it accurately closes the foramen. In children over eight to ten months of age, this border of the valve is generally found united with the corresponding border of the foramen ovale.

The Umbilical Arteries.—Having spoken of the umbilical vein in connection with the closure of the ductus venosus arantii, there only remains to describe the obliteration of the umbilical arteries. The two arteries originate from the corresponding hypogastric arteries, are thicker than all its other branches, and pass upward along the bladder. They embrace the urachus, and with it run upward between the abdominal muscles and peritoneum to the umbilicus. Passing through the umbilical ring they run spirally in the cord, and reach the placenta, in which they divide and subdivide. As soon as the connection between the uterus and placenta has ceased, thrombi form in the umbilical arteries reaching almost to their origin from the hypogastria. These arteries remain pervious for a short distance from their point of origin, and here give off several arteria vesicales; in the female, in addition, the arteria uterinæ. The remaining portion between the arteria vesicales and the ring, ultimately becomes obliterated, and converted into a fine white cord.

Together with these *mechanical* alterations, still more important chemical processes take place on the entrance of air into the lungs. Through the alternate action of air and blood, and the interchange of gases which the walls of the capillaries lying against the pulmonary alveoli and the walls of the alveoli themselves have to transmit in two opposite directions, both air and blood are so altered that the former becomes irrespirable, the latter arterial and thus qualified for nutrition. The new-born has now both arterial and venous blood.

CHANGES IN THE THYMUS GLAND.

The thymus belongs solely to the infantile organism, and is found embedded in the anterior mediastinum. It is sometimes confined to the space between the upper part of the pericardium and the roots of the large vessels, measuring in width barely half an inch, but sometimes reaching from the thyroid gland down to the diaphragm, and then measuring more than two and a half inches in width. Its principal arteries (according to Jendrassic) are branches derived directly from the large blood vessels upon which it lies. According to the same author, the thymus is composed of two often very unequal parts, which are united by a membrane formed of several delicate laminæ, in which most of the principal vessels terminate. The form of such a thymus moiety is an oblong, the upper third sometimes thin and rounded, while the rest is more flattened and broader, a larger or smaller portion often curves upward like a horn from the lower end over the outer border of the gland. When the thymus deviates from this form, each half has the shape of thin cord-like stripes, or when of large size is divided into several rounded lobules, intimately united by a thin parenchymatous structure, lying near or upon each other: all instances the anterior surface facing the sternum is convex, the posterior slightly concave. At first the thymus is solid, firm and granular, but in time becomes converted into a softer mass, in which many cavities may be found containing a fluid that almost always reacts with acid. The softening progresses from the central axis where the principal veins terminate in an extensive deposit of connective tissue toward the periphery. The gland grows constantly flatter, its cavities approach one another more closely, so that no more of a glandular parenchyma can be seen, and at the time of commencing puberty it has as a rule completely disappeared, although it has been found exceptionally in adults. In tuberculous children it has been found infiltrated with tubercular deposit. Carcinoma of the anterior mediastinum, which in children occurs comparatively more frequently than in adults, most probably has its starting point in the thymus gland. The supposed abscesses said to occur in syphilitic children are nothing more than the cavities that are regularly developed in the retrograde metamorphosis of the gland, and are also found in children who are perfectly free from syphilis.

CHANGES IN THE SECRETIONS.

All the mucous membranes which in the foetal state produced but a slight amount of secretion, commence after birth to secrete their

peculiar fluids. The mouth and nasal cavities become moist and lubricated, the latter often very imperfectly, so that it frequently becomes necessary to remove the dried mucous crusts.

The Salivary Glands it is true also secrete a little fluid, which, however, has not as yet the same perfect chemical properties as in the adult, for it is only able to very slowly convert starch into sugar. The stomach likewise begins to secrete a fluid which dissolves the casein contained in the milk of the mother. The liver which fills up the greater part of the abdominal cavity, secretes a light brown bile, which gives to the faeces after the dark brown meconium has been evacuated, an orange yellow color.

The Meconium, according to the generally prevailing opinion, is a mixture of bile, intestinal epithelium, but this has been proven by Foersters investigations to be incorrect. It consists rather of flat scales, which possess all the characteristics of flat epithelium, and consequently could not have originated in the intestinal canal, resembling in their entity, those of the vernix caseosa ; and in addition, of fine hairs, in the same quantity as in the latter, fat globules of various sizes—evidently cutaneous fat peculiar to the vernix caseosa—crystals of cholesterine (which may partly originate in the bile, or may be retrograde products of the vernix caseosa) and irregular brownish and yellowish lumps and flakes, which give to the meconium its dark color, and without doubt the coloring matter of the bile. It is therefore evident that the meconium, excepting the last mentioned substances which originate in the bile, consists of *vernix caseosa* ; and from this it may be inferred that the foetus has from time to time swallowed a tolerably large quantity of amnion, containing the vernix caseosa in suspension, the water of which is quickly absorbed by the stomach, for none is ever found in it, but the hairs and scales pass through the whole intestinal tract as indigestible substances.

The intestines, as we shall see after birth, secrete a certain amount of mucus, an excess or deficiency of which will give rise to diarrhoea or constipation. The first is the most frequent disease to which the nursling is subject.

The Kidneys.—Quite a severe task is imposed upon these organs, immediately after birth. In the first few days children drink but very little, the blood can part with only a very small quantity of water, and thus it happens that the uric acid salts, the results of the great metamorphosis of tissues, quickly accumulate in the urinary tubules, remain undissolved there, and from this too highly concentrated solu-

tion the product that has been called the *uric acid infarction* (obstruction) of the new-born is deposited. This with the congested condition of the mucous membrane gives rise to suppression of urine. The uric acid concretions are yellowish-red or pink-red casts of the pyramids near the papillæ. Generally, they appear for the first time on the second day after birth, and last from five to twelve days, but they have also been found in children more than four weeks old. It is frequently found as a carmine-red powder in the diapers of the new-born. Microscopic examination reveals minute columns composed of cylindrical, amorphousurate of ammonia, and epithelium cells, with here and there solitary rhomboid uric acid crystals. On the days this powder is found in the diapers, the children are usually restless, cry on micturition, and have an inflamed meatus. Although its origin and excretion must be regarded as physiological, it cannot be denied that kidney gravel so frequent in children, as well as the occurrence of urinary calculi in childhood has some connection with it. The administration of *Lycopodium* will most always be followed by relief in these cases.

The Skin, which during foetal life was continuously of the temperature of the maternal blood, with the act of delivery becomes colder, for now it is subject to the changes of the air, light and temperature, and also assumes the function of secretion. At birth it has a uniform red color, which however between the second and sixth day changes to a yellowish, and then into the ordinary rosy-red tint. The yellowish color is often erroneously regarded as icteric. New-born children are covered almost all over the body, with the exception of the palms of the hands and soles of the feet, with fine, soft, often tolerably long hairs (*lanugo*) which fall out in the first weeks of life. So too the long hairs upon the head, with which children sometimes come into the world, fall out in the first weeks of life, and are generally replaced by a growth of fine light-colored hair. Feeble children of slow development, and those devoid of solid adipose tissue retain these first hairs much longer than those which develop rapidly. This will be explained further on.

The Sweat Glands in the first weeks of life, perform their function but very imperfectly; it is almost impossible to bring a child under four weeks old, into such a state of transpiration that the perspiration will gather in drops.

The Sebaceous Glands on the other hand, from the beginning of the second month up to the end of the first year, in all children is almost

always increased in amount, forming seborrhœa capillitii, which should be classed with the physiological conditions of sensitiveness of this first wide awake sense of feeling. This seborrhœa capillitii develops very gradually; at first the scalp looks as if it had been smeared with tallow or cerate; upon this hard skin dust and dirt become adherent, and with the lardaceous secretion of the skin, dry into grayish-white, or yellowish and, subsequently into brown and even black scabs, which crumble easily between the fingers, become detached, and leave the scalp in a healthy uninjured state, and not even congested. It is not attended by any itching, moisture, or cutaneous infiltration. By a diligent application of *Olive oil* and washing the head occasionally with soap and water, this formation of scabs may be arrested without any danger to health.

It will be seen at a glance how great is the change in the vascular system, and also that the chief part of the circulation is directed to the mucous membranes, which at this age includes the skin.

MANAGEMENT AFTER BIRTH.

Premature infants, or those born before term, need a peculiar care. Usually they are still-born or utter only the most feeble wail. If still-born they need the same treatment—insufflation of the lungs, as do those born in an asphyxiated condition. (See Apnoea or Asphyxia.) Careful breathing into the lungs, simulating normal respiration, will usually establish the normal inspiration and expiration. If the cord still pulsates, it may be allowed to stop beating before ligating it. The child in the meantime should be carefully protected from the cold air, unless it be deemed best to allow the contact of the cool air or water as in case of complete apnæa. If the respiration is established but the cry feeble, evidently from debility or general weakness, then the child should be kept covered or partially so, while the cord is being ligated and the nurse is making preparations for its reception. I have found that a roll of cotton batting is the best and most convenient article in which to place a premature infant. If very premature, no effort should be made to wash and dress it. The surface may be rubbed off with oil or lard, a portion at a time, and a thin piece of muslin put inside the rolls of wadding next to the infant. The cord should be left without any wrappings except a wind of soft cloth. The whole child should be enveloped in the roll of batting except a small opening at the mouth for respiration. It should then be placed on a pillow in a crib or on a chair near the fire where the temperature is from 80 to 90°. Later the wadding may be quilted into soft muslin or cotton cloth, making it about two inches thick. This may be made so wide as to fold over the child, and should be pinned all around with safety pins, except a small space opposite the mouth. In a case of triplets still-born between the seventh and eighth month, two of the infants were thus enveloped for weeks, while under ordinary care I am sure none would have survived. "What shall I feed such a little puny infant" is an anxious question that we must answer. I have found that if a premature child is well oiled twice a day with *Sweet oil* or *Oil of Sweet Almonds*, they will usually sleep most of the time. We must not forget that the mucous membrane is also premature, and that it is in no condition to digest much caseine, therefore the food

should be oily. Cream diluted with three parts of sweetened water, is the best and most convenient diet until the mother's milk arrives. If the sugar is dissolved in the milk first, a better solution is obtained. Sometimes they cannot nurse from lack of muscular power, but will swallow if the milk is squeezed into the mouth. At times the effort of suction and swallowing is so spasmodic that we will need to aid this operation by closing the mouth and lifting the glottis with the fingers. We must remember that all of the infant's first motions are in a measure, spasmodic. Children born at full time, often make spasmodic efforts at suction and deglutition at first, especially if they have been rendered nervous by colic, rough handling, bathing, hunger, etc. The premature infant does not require to be fed as often as if full time. Feed it when it cries for food, is the rule; still if it sleeps all the time and seems stupid and hard to rouse, it should be wakened to be fed as often as every three hours. If the mother is strong and the weather not cold, the infant will thrive best if kept in bed with her. The moist heat from the body keeps up the normal temperature, and at the same time prevents the abstraction of moisture which is so liable to occur when the infant is placed near the fire; still if well oiled, this will be prevented in a great measure. Attention should be given that the extremities are kept warm. If inclined to be cold, the nurse or some kindly officiating neighbor should hold them in her hands, or they may be wrapped in the cotton separately, and a bottle filled with hot water placed near them. The temperature of the room should be kept above 80° if the child is very feeble. If it gets chilled, colic is apt to distress both the child and attendants. In case of colic, a little warm sweetened water will usually quiet it unless indigestion is also present, when the indicated remedy must be carefully selected. *Chamomilla*, *Belladonna*, *Lycopodium*, *Pulsatilla*, *Nux vomica* or *Colocynth*, have been the chief remedies I have found indicated. Great caution must be exercised that the child is not over-fed. The disorders to which the premature infant is most liable, aside from colic, are icterus neonatorum and eclampsia. These will be treated under their appropriate headings.

Full Term Children.—The treatment recommended by modern accoucheurs for the newly-born full term child is altogether rational, except the practice of allowing a little blood to escape after having cut the umbilical cord, and for the use of chicory syrups, etc. Since the child no longer receives blood from the umbilical veins, it should not be allowed to lose any from the arteries. We should never forget that blood is the principle support of life.

As soon as the cord is tied and severed, the child should be placed in a blanket and given to an attendant to be washed and dressed. The infant should be well oiled or greased with *Sweet (Olive)*, *Almond* or *Palm oil* or *Lard*, and washed with *Castile soap* and warm water. Should there be any excoriations about the anus, vulva, groins or flexures of the joints, a little very fine starch or flour should be dusted over such places. The washing, dressing, etc., should of course be performed near a fire. Care should be taken that the eyelids, ears, nose and all folds and creases of the skin, as the neck, buttocks, should receive a thorough cleansing, as a neglect of this may result in an obstinate intertrigo. The navel cord should now be examined, to see whether there is any haemorrhage from it, and if necessary, an additional ligature should be placed upon it. This is sometimes necessary as the gelatinous fluid contained in the cord may escape in such quantity as to lessen the diameter of the cord, and the first ligature does not confine the vessels so as to prevent an oozing of blood. The cord should now be dressed as indicated for its management. A flannel binder should now be evenly but not tightly applied.

Croserio cautions nurses against the mania of the accoucheurs and midwives, for giving a warm bath every day to infants in washing them; this practice imported from England to France is entirely contrary to the views of nature; the skin so porous, so spongy at this age, absorbs too great a quantity of water, and disposes the child to a predominance of the lymphatic temperament; this bad habit has certainly something to do with the enormous proportion of tubercles among the English, since these tuberculous affections are the last expression of the lymphatic constitution. (*Homœopathic Manual of Obstetrics*, page 132.) This caution is valuable. Water, and especially warm water aids the elaboration of much connective tissue, from the white blood corpuscles, and gives a grossness to the child, and tends to obstruct the lymphatic system. This may be obviated by laving the surface of the body with oil, e. g., *Olive*, *Almond*, (*Sweet*) or *Palm oil*. The buttocks, groin, perineum, etc., should be washed immediately after each discharge of faeces and urine and in this way prevent the distressing excoriations that so frequently make their appearance.

As the infant is exceedingly susceptible to cold, it will need to be warmly clad and in this connection it would be well to bear in mind the rule laid down by Churchill, "as regards the dress; the infant requires *softness, looseness and warmth.*" For some hours or even days the child will not require food unless very vigorous, its first neces-

sity being warmth and sleep ; and here we enter our earnest protest against the administration of gruels, farina etc., which a misapplied kindness would pour into the infant's stomach. In a case we met, a frightful diarrhoea followed the introduction of corn meal gruel. At the most, a few spoonfuls of sweetened water is all that should be allowed. On awaking from its first nap the child will be found to have passed water, and perhaps the meconium. Nothing should be given to purge away the meconium as recommended by ancient authors. The mother having rested by this time, the infant may, if very restless and clamorous for food, be applied to the breast. The mammary glands usually contain already a secretion, which is sufficient in quantity and quality to nourish the little one ; this is the colostrum, a fluid differing from true milk in that it contains a larger amount of oil globules, and which precedes the real milk by three or four days.

Should the secretion of milk be notably diminished, the child will have to be fed. (See chapter on Food.) The child should be allowed to nurse at regular intervals of about two hours. In the interim it should be kept quite warm and not awakened when sleeping. At first it is apt to sleep irregularly and should then be fed when hungry, i. e., when it awakes. If the room is kept quiet and it is not disturbed only once in about two hours, the habit of waking for food regularly may be formed in the first few days. Regularity is a law of nature that should be closely conformed to. It will insure health to the infant and comfort to the attendants. If the child is fed regularly in the day, it will usually sleep overtime at night. As it grows older the time of feeding may be gradually lengthened. If this regularity is upset by sickness, the child will need food oftener while convalescing, but the old habit of feeding should be more or less rapidly returned to, according to the age. A few words in reference to the necessary dress. A binder of soft flannel is necessary to confine the cord in its place, but this should be loosely and smoothly applied so as to allow distension of the abdomen as in respiration, after eating, during colic, and when being held in the sitting position. How long this band should be worn is a question not fully settled. Some would dispense with it as soon as the navel is healed, but we must remember that much distension of the abdomen occurs up to the sixth month, so great as to separate the walls of the abdomen, giving us, about the third month in some cases, acquired hernia. (See Hernia). If the child is thin and eats heartily and develops fat rapidly, it is well to continue the binder. When the

distension of the walls of the abdomen is great, there is a tendency, from colic, to over-eat which the binder seems to control.

The rest of the dress should consist of a flannel skirt and a loose dress .An extra skirt, or better yet, a pinning-blanket may be put on in cool weather. The skirt should be long enough to envelope the feet for the first few months. If the feet are inclined to be cold, stockings should be worn early, cold feet aids indigestion, colic, etc. The skirts should be supported from the shoulders, so as not to constrict the chest or abdomen. Infantile respiration is chiefly abdominal and nothing should impede it.

ASTHENIA, OR GENERAL FEEBLENESS.

Infants sometimes present at their birth an intermediate state between sickness and health; this is what Billard and other writers term the "feebleness of birth." The expression is often very vaguely employed, and the apparent feebleness is not always the result of imperfect development of the foetus, as is observed in premature children, but of more or less important alteration in some organ essential to life, an alteration commencing while the child was within the womb.

We will endeavor here to fix the proper idea which should be attached to the term "feebleness of birth." If the external condition of new-born children be examined, those will be considered as feeble where the trunk and limbs are thin, where respiration is difficult, and where the cries are scarcely heard, and who, being unable to retain the drinks, or milk, appear always about to expire. If we trace this state of the system to its proper source, we will find the causes to be very variable, and referable to various kinds of lesions.

In the first place, it is necessary to distinguish the feebleness of birth from the pulmonary or cerebral congestions often produced by some cause during labor. These accidents are recent, and the child affected exhibits, with the exception of drowsiness or syncope, all the natural vigor of health. But it is not the same with those debilitated children whose limbs are, as it were, almost deprived of flesh, and whose bodies are covered with wrinkles, and their eyes sunk, and their general appearance of the most frightful description.

Billard found in eighteen children, born at the full time, and in a complete state of debility and emaciation, a very intense inflammation of the gastro-intestinal apparatus. In six others, pneumonia had evidently existed; in two, a peritoneal inflammation, characterized by adhesions already quite firm, and by the affusion of a yellowish fluid; and in one there were signs of chronic pleurisy. These facts will be subsequently referred to, with all the circumstances which render them interesting.

It is nevertheless far from being true, that all children born with important changes in some one of their organs, exhibit the emacia-

tion and feebleness of which we are speaking ; the contrary will hereafter be seen to be the case ; a very serious disorganization of the cerebro-spinal apparatus often exists, while the form and symmetry of the infant are not in the least affected, but present the usual signs of healthy development. We also not unfrequently see infants quite robust at birth, if we may judge from their good condition, and the proper conformation of their limbs, expire some hours or days after birth, and presenting, on the examination of the body, a sanguineous congestion of the principal organs, such as the brain, lungs, or intestinal canal, with an effusion of blood in the cavities of these parts.

On the other hand, all those born emaciated and feeble, are not necessarily affected with serious lesions, and upon a post mortem examination, they often exhibit none ; of which the following is an example, given by Billard :

"Marie Loisel was brought on the 5th of August, 1826, immediately after birth, to the Hospice des Enfans Trouves. She measured thirteen inches and a half in length, the superior and inferior extremities were extremely small, the face was pinched and very red, the integuments of the ordinary color, the movements but feeble, and the cry, although perfect, was scarcely audible. the temperature of the surface was natural. She drank without vomiting, but refused the breast. In the evening she passed a considerable quantity of meconium. She continued for some days in this state, and died on the morning of the 19th day, presenting no symptoms but those of extreme feebleness.

"On examining the body twenty-four hours after death, the mouth was found healthy, the oesophagus injected, particularly at the lower part, the internal surface of which was lined with thick mucus, the liver small, and the lungs crepitant, except at the posterior part, where they were engorged. The ductus arteriosus and the foramen ovale were quite open. The brain was a little softened, and of a yellowish tint ; the lateral ventricles contained a red serous effusion. In the cellular tissue of the limbs there was found a yellowish and limpid serum.

"It is evident that death in this child was caused by the state of universal feebleness existing from birth ; this congestion of the intestinal canal, the serous effusion in the ventricles of the brain, and infiltration of the limbs, denote a passive and almost an inanimate condition of the principle organs, and especially of those appertaining to the circulation. We shall hereafter present other analogous facts ; it is however admitted, that these conditions are rare without the existence of some other morbid cause than that of general debility of a new born child." The small liver, congested mucous membrane and length of the infant, would indicate an arrest of development. Children often fall into a state of marasmus after birth, which M. Gardien has described under the title of feebleness of new-born chil-

dren. It will be seen hereafter, that this progressive feebleness is often produced by chronic disease of the digestive organs, in which the employment of stimulants and tonics, as is recommended by M. Gardien, and later allopathic writers, to restore the sinking powers of the child, is contra-indicated. In the course of this work numerous proofs of the positions now advanced will be given.

From all these considerations, it will appear—1st, That in every instance in which an infant is born feeble, thin, and possessing but little vitality, these symptoms should not be attributed to a feeble development of its organization. 2d. That a variety of different lesions may be the cause. 3d. That before administering tonics and stimulants, we ought to search for the true cause of the existing debility; an examination of which can be made, if the nature, progress, and symptoms of the diseases of children at the breast be properly studied.

Many such cases are met in all foundling institutions, but are also sometimes met in private practice. The cause, in some cases, I have found to be too great activity of the mother during gestation.

Treatment.—On general principles, *China* would be a valuable remedy, unless the symptoms point strongly to some other.

*THE MANAGEMENT AND DISEASES OF THE
UMBILICUS.*

It is proposed to consider here all the phenomena which precede, accompany, and follow, the separation of the umbilical cord. Notwithstanding the interesting accounts on this subject contained in the numerous treatises on midwifery, and legal medicine, there still exists a want of information in reference to it; especially in works on diseases of children, and we have been urged to treat it fully.

MANAGEMENT OF THE NORMAL UMBILICUS.

Before the cord is divided, it should be carefully examined to see that there are no abnormal structures in it. The cord consists of three blood vessels, in a gelatinous envelope. A portion of the omentum or loop of intestine may be enclosed in it. Sometimes the funis is very large, having a broad attachment to the abdomen; in other cases it very abruptly narrows to a mere cord. Sometimes it is narrow throughout. In such cases the infant is either premature or very poorly nourished. If the cord has a thick envelope, the child is usually large, and well supplied with fibrous tissue--fat and white blood. When the cord is small, and has a small but rather firm envelope the child is usually small, rosy, having plenty of red blood. In the former case there will be a tendency to suppuration when the cord comes to desiccate, while in the latter it will bleed easily, and will be liable to inflammation of the stump. Some physicians, after cutting simply compress the cord, and trust to the serum to plug it.

When the cord has been cut, it should, we believe, be tied. We may wait for some blood to escape from the vein, or tie at once. To prevent oozing, it is, however, always best to tie it. This may be done with anything, twine, tape, thread, or even a piece of rope, if that is the only thing at hand, as happened to the author once, when called to a woman taken sick on the street, who sought refuge in a livery stable. After the child has been properly washed, then we should see that the navel string is carefully dressed. The old plan of dressing it was to pass it through a hole in a fold of linen. Some vary this method by wrapping the cord with a soft piece of linen, and then

laying it between two folds of cloth. The best dressing is that adopted by Guernsey, as follows :

"A piece of raw cotton or cotton batting, of the size of the palm of the hand, should be laid on the abdomen just above the navel, the remnant of the cord laid on it with its cut end pointing upward—the cotton being arranged so as to embrace the base of the cord—and another piece of cotton of the same size placed over the cord, the whole being kept in place by the usual belly-band. So well convinced am I that this is the best plan of treatment for the navel, that I do not think I shall ever change my practice to go back to old methods."

—(Guernsey's *Obstetrics*, p. 199.)

This plan effectually guards against the possibility of inflammation being set up, either at the umbilicus itself, or in the abdominal walls, by the irritation of the hard dried cord. The direction to place the cord "with its cut end pointing upward," I have modified by turning the stump to the *left*. We should ever bear in mind that the liver occupies quite half of the abdominal cavity at this time, and by turning the tied funis to the left we avoid exciting any pressure upon that organ, and at the same time prevent colic.

The belly-band should now be applied, and may consist of either flannel in winter, or soft muslin that has been washed. In either case, it should be slightly elastic. This is especially important after the child has begun to eat. We must remember that its digestion is chiefly intestinal, and therefore its circumference will vary from a half to a whole inch from hour to hour, and towards night even more. A tight bandage is a fruitful source of colic, especially is this true when the cord is shriveled and hard. The management after the cord has "desiccated," and "separated," will be given further on.

THE DESICCATION OF THE UMBILICAL CORD,

and the time of its separation from the abdomen, differ very considerably in different individuals, insomuch that it is extremely difficult to establish any fixed rules.

Billard has made this a subject of careful study. His observations included eighty-six children of different ages and sexes, all apparently in good health. In the first place he examined particularly the two well-marked differences between the cords which have been pointed out by accoucheurs. Some umbilical cords are large, soft and thick; these contain, according to Wharton, a great deal of gelatine; others are small and thin, and contain very little albuminous matter. The former require a larger time to dry away; they have a tendency to soften, and often separate at the base. The latter soon become

dry and transparent like parchment, they desiccate very rapidly, and upon becoming quite dry, black lines, the remains of the blood-vessels, may be observed in their tissue. About one third of the whole number are of slender kind, the remainder are of those abounding in gelatinous matter. Before desiccation they shrink, which is the beginning of this process. The following shows the results of observations in relation to the time at which the desiccation commences.

Of eighty-six infants who came under Billard's notice, the cords of sixteen were a little shrunk, but were at the same time quite fresh. They were soft, bluish, and very flexible, and completely filled the ligature; the cut surface was quite smooth. Of these sixteen, one was of the age of five hours, six of one day, four of two days, and four of three days. These cases afforded an opportunity of observing the shrinking of the cord from the first to the third day after birth. But it does not always follow from this, that the desiccation, which always succeeds the shrinking, never commences until after the third day. It often begins much sooner, as we shall see by the details which follow. Among the eighty-six infants whose cases we are now considering, there were twenty-four where the desiccation had either commenced at the summit, arrived at the middle, or had already spread near the base of the umbilical cord. Seven were but of the age of one day, eleven of two days, three of three days, and three of four days. Among some, the cord was large and very soft, with a thick, projecting cutaneous ring at the base. In neither of them did the extremity exhibit a smooth surface, but it had begun to blacken and shrivel, while the ligature was quite loose; in the greater number of cases, there had been no inflammation of the umbilicus. By this it will be seen that the desiccation generally begins on the first or second day; it has sometimes, however, been as late as the fourth day.

The period of the complete desiccation of the cord is not less variable. Among the eighty-six infants to whom reference has been made above, there were twenty-five where the cord was perfectly dry; of these, five were of the age of two days, nine of three days, five of five days, four of four days, one of one day, and one of one day and a half. The third day, therefore, appears to be the usual time at which the desiccation of the umbilical cord is completed, although it has not occurred in some cases until the fourth or fifth day; and, as we have seen, been even as early as the first day. But it ought to be known that the cords in the last mentioned cases were extremely thin, and it was owing to this peculiarity that the desiccation was hastened.

Immediately upon cutting the cord the vessels retract and disappear in the gelatine, which constitutes so large a part of the cord, and which gives to it its form and thickness. This gelatine begins to dry away even while the exterior membrane retains its suppleness. It is not always at the summit that the desiccation commences, for it often exhibits the beginning of this process at the place where the ligature remains for some time soft. The cord shrinks and shortens; at the same time, a general constriction takes place from the circumference to the centre, whereby the vessels become compressed, flattened, and tortuous, and at last partake themselves of the desiccation. They are solidly compressed in the thick, dried lymph, resisting any further retraction, and exhibit small black opaque filaments, winding in the middle of a semi-transparent substance. At this period the ligature is altogether useless, and haemorrhage from the extremity of the cord need not be apprehended.

The desiccation progressing by degrees towards the navel, stops at last at the cutaneous ring at the root of the cord, from which the dried portion soon becomes separated, either by a proper suppuration, or by a spontaneous detachment analogous to that by which the stem of a cucurbitaceous fruit is separated. The dried gelatine, and not the epidermis, as has been asserted, forms around the three-fold vascular bundle, a kind of knot which compresses and defends the walls of these vessels. There exists always between this point of constriction and the place where these three umbilical vessels pass to their destination, a space or neck more or less short, where the cord consists of nothing but a little vascular bundle, the last connection of the abdomen with the cord, moving in every direction as on a slender pivot. This vascular line is entirely surrounded by the cutaneous ring of the umbilicus, upon the circumference of which the separation of the cord has left small excoriations; it does not, as has been asserted by Gardien, produce any constriction upon the umbilical vessels. The skin of the umbilicus gathers in large folds when the base of the cord is dried, but it is by the drawing of the hardened gelatine, and when the separation is effected around the whole circumferences, that the skin of the umbilicus becomes thus folded upon itself. This condition of the skin, therefore, is the result and not the cause of the desiccation. It is at this point, that is to say, at the point where the gelatine ceased to exist, that the cord separates, and all the concurrent circumstances then favor the event. Indeed, even the crying of the child, producing every moment an

elevation and depression of the diaphragm and liver, and causing the alternate movements of expansion and retraction of the parietes of the abdomen, materially assist it; the effect produced being a continual drawing of the umbilical vessels towards the interior of the cavity of the abdomen, while on the other hand the external dried portion of the cord, being drawn by the clothes of the child, or fixed by its appropriate bandage, resists with considerable force the internal movements; the cord, yielding at its slender part to this constant drawing, separates and falls. Thus, the desiccation is the predisposing, and the pulling of the cord the immediate cause of its separation. In this way we can explain how it happens that the cord is always ruptured at the same place, and why we never see it detach itself at the abdomen before the complete desiccation of the gelatinous matter. The desiccation of the cord is altogether a physiological phenomenon, belonging to the assemblage of vital phenomena, and entirely dependent upon them. That part of the cord attached to the placenta does not exhibit the phenomenon of desiccation, like the portion remaining with the child, but shrinks and decays like a dead substance, whilst the abdominal portion is not so affected. Here the desiccation ceases as soon as life is extinct; it either does not proceed in still-born children, or it is considerably retarded. In place of drying and separating at the end of a few days, as is observed during life, the cord undergoes in the dead body a perfect decomposition, differing entirely from its normal desiccation. We often see a foetus brought into a theatre for dissection, and remain there some days without the cord becoming dry; it will even continue soft, and the vessels sufficiently open to allow of being injected; while during life it dries, and the vessels are obliterated on the first, second and third days; and Billard has never seen the cords dry away at first, but remaining soft and flexible until the fourth or fifth day, when they often separate in a state of putrescence. Billard was able to inject the body of a still-born child from the umbilical cord at the end of four days, only taking the precaution to moisten the extremity, which had become a little dry. The cord did not exhibit the least degree of desiccation, but was only very tender. The normal desiccation of the umbilical cord may therefore be regarded as a physiological phenomenon, occurring only during life, and ceasing with the suspension of vitality.

In support of this assertion, Billard cites the following cases: Three living but feeble children, born at one birth on the night of

October 20, were brought a few hours after to the Hospice des Enfans Trouves. One of them died six hours after birth; the cord of this child was very soft, and not in the least shrunk. Another died on the night of the 22d; the cord of this one was flattened, twisted, and dried about half its length. The third died on the morning of the 23d; the cord of this child was dry nearly the whole length. In neither of these cases was there red circles around the umbilicus. The first mentioned child was carefully preserved in an envelope; and on the 24th, the cord had not yet showed any signs of desiccation, but was only a little shrunk. The desiccation of the cord was not at all effected in this case, death having entirely prevented its occurrence, whilst in the two that survived, the phenomenon was observed to commence and to run its course until arrested by death.

Without attempting to explain how this phenomenon, which appears to be altogether physical, is so intimately connected with life, we merely remark, that the animal heat, which during the life of the child, is communicated to the cord, favors very materially the evaporation and drying of the gelatine of Wharton, and that the moisture which exhales from the dead body, keeps the gelatine soft, or hastens its decomposition; whether this be the case or not, the fact exists, and it appears to me proper to keep it in remembrance, from its important application to legal medicine. For if a fœtus be examined some time after birth, or when the body has been disinterred, if the cord still remain attached, we ought to observe closely if it exhibit the peculiar characteristic of a normal desiccation; that is to say, whether it is red, flattened, and twisted, and the vessels obliterated; or whether it is soft or in a state of putrefaction, analogous to the general condition of the dead body; for in the former case, the child could not have been still-born, but might have lived one or two days, since the desiccation, which only exists during life, had already commenced, while in the latter, the infant was still-born, or had lived but a short time; the umbilical cord flabby or slightly shrunk, having not yet experienced the proper desiccation. In short, such is the importance of the fact, that I would particularly call the attention of physicians to its consideration, that it may, in conjunction with other circumstances, concur in demonstrating whether the child was born alive; as the principle can be laid down that in every instance in which the cord is dried, flattened, twisted, and blackened upon the dead body of an infant, it has lived at least one day, this condition never being produced on a dead body. To recapitulate: The conclusions applicable to legal medicine upon examining the umbilical cord before its separation, are:

1. The desiccation of the umbilical cord cannot take place except during life.
2. At the period of death, the desiccation is suspended, or considerably retarded.
3. If the cord be fresh, or the shrinking but just commenced, the infant may have been still-born, or have lived but a very short time.
4. If the cord has already exhibited the beginning of desiccation, or is completely dry, the infant has lived at least one day. The more recent the death of the foetus, the greater is the dependence upon these conclusions.

When the cord is left to putrefy upon the dead body, it first assumes a greenish white color; it then becomes corrugated at the extremity, and shrinks. The pellicle of the cord is easily detached, but the cord will not separate from the abdomen at its point of insertion, as is observed to be the case during life; it may easily be torn in all places, and lessens and withers its whole length, and if the child has been immersed a long time in water, it remains flabby and tender; the same thing occurs when the child is dead, and has remained some time in the waters of the amnios. In the opposite case, it exhibits much more resistance, and less softness, and the umbilical vessels which perform the office, as we may say, of a root, will constantly oppose a considerable degree of resistance to the force which may be used to break it. Billard never saw the cord of a still-born child become dry before the fifth or sixth day, and he also observed, that it preserves its circular form and suppleness for some days. Dr. Ollivier, of Angers, has favored us with a very interesting communication on this subject.

He was called on the 28th of September, 1826, with Messrs. Marc and Denis, to examine at the morgue, the dead body of a male child, born at the full time, having been eight or nine days dead. All its parts were reduced to a state of complete putrefaction, the cavities were distended with gas, the substance of the lungs was completely putrid, and the umbilical cord, which appeared not to have been tied, itself partook of the general decomposition of the body. Its length was about four inches, and near the umbilical ring, the envelope of the cord was simply a thin pellicle, through which the umbilical vessels could be seen; and in the place of being dry, flattened, and twisted, as is usually the case, it had formed a puckered sack at the extremity; in the interior of which the gelatine of Wharton had disappeared; this sack resembled a membranous case, with transparent walls, analogous to a portion of intestine, distended with air and dried. The epidermis upon the abdomen was removed

as soon as it was touched, and yet the membrane of the cord, and the cord itself, was firmly adherent.

We ought not to confound this condition with the proper desiccation of the cord, it having, in the instance before us, undergone a real decomposition, not producing its separation, because the circumstances which affect this during life, had not existed. It has been noticed that the putrefaction of the cord does not commence until after the decomposition of the other parts of the body, so that it is never found putrefied, unless the walls of the abdomen are green, and all parts of the body evidently in a state of putrefaction. Oiling the cord interferes with its desiccation.

SEPARATION OF THE UMBILICAL CORD.

This phenomenon is explained in different ways. Haller and Monroe attributed it to a kind of gangrene; and the celebrated physiologist of Berne, explains it in the following manner: "*Funiculi quidem umbilicalis particula quam obstetetrics solent cum abdomine parvuli conjunctam relinquere abit in sphacelam, quasi ambusta et post biduum, triduumque dilabitur.*" This opinion has been maintained by a great number of physiologists. Other explanations have been given in relation to this phenomenon. M. Gardien regards this constriction of the epidermis as the cause of the separation. Chassieur attributes it to an inflammatory action, developed at the umbilicus; this opinion is also adopted by Beclard, Professor Orfila, and M. Capuron. And lastly, Dr. Denis, who has made upon this subject some interesting researches, asserts that during the process of desiccation, the maceration of the base of the cord, by a mucous secretion, the retiring of the skin, and the putrid dissolution of the substance of Wharton, produce by degrees the separation of the cord. These physicians have observed a kind of separation at the base of the cord, under circumstances which we will hereafter notice more particularly; it is, however, not constant, but, as will be shown, is purely accidental. As to the opinion of Haller, it falls of itself. Let us admit then, for the present, the explanation given of the separation of the cord, and proceed to examine the facts which support the assertion.

The period of the separation varies materially. Among the number of infants mentioned above, there were twenty-one where the cord had separated, but in only sixteen of these, was it of recent occurrence. There were two in which the cord separated on the second day, three on the third, six on the fourth, three on the fifth, one on

the sixth, one on the seventh day—the cord of the last child dropped off while the examination was being made, and one on the ninth day. In another, on the ninth day, the umbilicus was dried and cicatrized; in one on the tenth day, the cutaneous ring rather small, and slightly projecting. In another, on the fifteenth day, the cicatrix was perfect, while the umbilicus was large, projecting, and surrounded by a red circle. The fourth or fifth day, then, appears to be the time at which the detachment of the cord is ordinarily effected, although it may occur equally before or after this time. It usually shrinks on the first day, and the desiccation immediately succeeds. This desiccation is complete towards the third day, and it is on the fourth or fifth day that the cord is separated from the abdomen. These general rules are subject to many exceptions, as we shall presently see; and it appears very difficult to indicate from these data, the precise age of the infant. Not much importance, therefore, should be attached to it in a legal point of view.

We agree perfectly as to these various periods with the authors who have written upon the subject about which we are now treating; but particularly with M. Gardien, for according to him the umbilical cord usually separates from the fourth to the fifth day. Professor Orfila says, in his "*Lecons de Medecine Legale*," that the umbilical cord begins to dry away on the first day, and that it is usually separated on the fourth, fifth, or sixth day. M. Denis also says that it dries about the fourth day, and that its separation is effected on the fifth, sixth, seventh, or eighth day. It may not in some cases, when the child is feeble, separate until the tenth day, or later. These results are, as we see, very varying, particularly if the numerous exceptions already given, are borne in mind.

It is nevertheless in our power to draw some inferences from these data, if we recollect the causes which produce the variations, and that they are not the effect of chance.

In the first place, the attachment of the cord to the abdomen, is exhibited in two different ways; it is either broad at the base, and the cutaneous ring with which it is surrounded well defined, often shooting forth to the distance of four to six lines up the cord, or else it is slender, with the cutaneous ring but little projecting, already wrinkled into folds, and presenting in some degree the appearance which it will have when the cicatrix at the umbilicus is formed. In the former case a suppuration more or less abundant, occurs at the base, and the cutaneous ring, often becoming inflamed, exhibits a red

circle, which frequently remains for a considerable time. In the latter, the cord generally dries away without any suppuration, and the inflammatory circle is not very evident, the desiccation alone producing the separation. This is effected in the manner pointed out above, and is more particularly evident in the dog, where the umbilical cord dries and falls at a very early period. But before going farther, the following facts will suffice to establish the distinction indicated. Of the eighty-six infants to whom reference has been made, one, at the age of one day, exhibited the cord fresh, with the umbilicus projecting, red, and tumefied, but without any appearance of suppuration.

Billard also observed the redness of the umbilicus, with tumefaction without suppuration, in seventeen infants. In three, aged one day, the cord was dried the half its length in the first two, and entirely dried in the third. Six others had arrived at the age of two days. In the first, the cord was dried, and in another partially so; the same with the third and fourth, in whom the cutaneous ring was very projecting. The cord was dry in the fifth, large and moist in the sixth, and abounding with blood at the base. There were four of the age of three days; one had the cord dry, another a little shrunk, the third dry and thin, and the cutaneous ring slightly projecting, while the fourth was dry. Two were of the age of four days, with the cord still humid at the base, and two thirds of its length quite dry; one of five days, where the separation of the cord was recent, and the umbilicus still humid; and one of fifteen days, in whom the cord had fallen some time before, the umbilicus cicatrized, and the cutaneous ring quite projecting and surrounded by a red circle. Such were the different states of the umbilical cord in the infants where the umbilicus appeared red and tumefied without suppuration. We will now see the condition of the umbilicus in eight infants, where, besides redness and tumefaction, a perfect suppuration existed. There was but one of the age of one day. The cord in this one was dry, the umbilicus a little projecting, and the surrounding red circle very small. Three others were two days old; in one of these the cord was dry at the summit, its insertion large, and the cutaneous ring very prominent. In the third the cord had recently fallen. In three infants three days old, there were two where the cord was dry, and in the third a little shrunk. Lastly there was one aged five days, where the cord was dry and very large at the point of insertion. There was but one infant of the age of three days, in whom suppuration existed

at the base of the cord, without surrounding redness. Thus out of eighty-six infants of different ages, only twenty-six exhibited traces of inflammation around the umbilical ring. This inflammation, then, is not indispensable to the separation of the cord,—it is not even a concomitant attendant. Billard never observed it, notwithstanding the most scrupulous attention, in the sixty-one infants, completing the entire number of those to whom he particularly directed his researches. It should be remembered that he makes a distinction between the suppuration at the base of the cord, and the oozing from the umbilicus which follows its separation. In no instance in these sixty-one cases, did the cord exhibit any putrefaction, but nothing more than a simple desiccation. I have often seen the cord separate in the manner above mentioned, without the concurrence of any inflammation. We should not, therefore, attach much importance as has been done by some distinguished writers on legal medicine, to the absence or presence of a red circle around the umbilicus, when we are examining the dead body of an infant to determine whether it died before, during, or after birth.

This inflammatory redness proceeds from a cause which I will now endeavor to explain. It is worthy of observation that the redness and suppuration were not manifested except in about one fourth of all the cases which form the subject of these researches, and that the umbilical cutaneous ring in children exhibiting this phenomenon, appeared very distinct, and the cord abounding in gelatine was attached by a large surface to the abdomen. Ought we not, therefore, to attribute this inflammation to the projecting of the umbilicus, by which it is exposed to the rubbing of the clothes and the friction of the dried cord? And can we not find in the gelatine of Wharton, or in the cellular tissue, which together surround the vessels of the cord, the materials of the suppuration? This redness is often partial, and is not manifested except at that portion of the cord which has suffered compression. At other times the inflammation appears and disappears several times, whether the cord remains attached, or whether it has been for some time separated; and it is not uncommon to see it remain for several weeks, producing an erysipelatous affection on the parieties of the abdomen. In order to avoid the irritation produced by the contact of the indurated cord upon this part, we ought carefully to remove a portion where it has dried, and always to apply a compress upon the umbilicus, through the centre of which a suitable opening has been made to allow of the passage of the umbil-

ical cord. If wrapped in cotton this direction will be unnecessary

Since, in the separation of the cord, two phenomena have been presented, in the one case the umbilicus inflaming and suppurating abundantly, while in the other the separation is produced by a simple desiccation, accompanied sometimes by a slight oozing from the base, but without any real inflammation ; we will inquire in which of the two the cord soonest undergoes separation.

The following facts will answer this inquiry. In twenty-one infants carefully studied by Billard, when the cord had fallen off, there were only three with the red circle around the umbilicus. One, aged five days, exhibited this redness without suppuration : another, aged three, had the redness with suppuration ; in the third, aged fifteen days, where the cord had been for some time separated, the red, inflammatory circle existed, while the remaining eighteen had not the least redness. I have before said that twenty-six infants exhibited the trace of a severe inflammation at the base of the cord, and upon the whole of the umbilical ring ; now in almost all these, although of different ages, the cord at its insertion was perfectly solid, and not at all dried at the base, consequently inflammation at the base of the cord is by no means a condition necessary to accelerate the separation ; on the contrary, it occurs in cases where the separation is generally more slow, for the cords most abounding in gelatine are the most ready to suppurate. We know that the desiccation of the base of the cord is one of the conditions necessary to its separation, but the abundance of gelatine retards this process ; consequently the cords that are provided with the greatest quantity of this gelatinous matter, are much slower in separating. Reasoning and analogy are here mutually sustained. However, as it sometimes occurs equally in a thin ring, in which a cord more or less slender is inserted, a premature separation of the cord may possibly occur even in cases of umbilical inflammation ; this circumstance is, however, rare. This inflammation must be considered as purely accidental, and not as an indispensable occurrence to the separation. Yet we find in the cases communicated to Prof. Orfila, and recorded in his *Lecons de Medecine Legale*, that in all the subjects the red circle existed. M. Denis, in the synoptical table which he has given upon the different phenomena attending the separation of the cord, has been less exclusive, and accordingly approaches much nearer the truth. From the preceding observations, it is evident that the separation of the cord is the result of the constriction which the indurated gelatine exercises upon

the umbilical vessels at the umbilicus, and also of the continual pulling from this narrowed point of the cord so dried and fragile; and that there is neither gangrene of the cord, as Haller thinks, nor constriction of the epidermis, as asserted by Gardien—a constriction which so inert a pellicle could hardly exert; nor yet contraction of the skin with inflammation of the umbilicus, as Capuron pretends; neither is it necessary that there should exist an active inflammation with suppuration, as has been maintained by others,—this last condition having no existence except in peculiar circumstances. Besides, it is well known that inflammation and suppuration of the parts in which vessels are often found, will not always cause the rupture of the latter. Veins and arteries are often seen remaining healthy in the midst of large abscesses. Beclard has observed that arteries in inflamed parts hardly ever inflame. Dr. Berard, in his inaugural dissertation, has given a remarkable fact in support of this opinion. If this be so, how can it happen that an active inflammation of the umbilicus is necessary to produce a rupture of the umbilical arteries and vein, that the separation of the cord may be effected?

The treatment the stump demands is simple. It should be protected by a bit of cotton or a burnt cloth, especially if there is any tendency to suppuration. Care should be taken not to keep it too warm, so as to invite inflammation by the heat or acid perspiration. The urine should never be allowed to irritate it by neglecting the child too long. The band should not be so tight as to compress it too much, nor so loose as to irritate it by friction. Its healing is worthy of special study.

CICATRIZATION OF THE UMBILICUS.

In order to understand properly the changes which take place at the umbilicus, after the separation of the cord, we must not lose sight of the two kinds of umbilical rings; the one but slightly projecting and already corrugated, is usually found among the cords that are thin and small; the other very large and projecting, covering a large portion of the base of the cord, occurs where the cords are thick and moist.

In proportion as the desiccation advances, the circumference of the umbilicus appears at first to gather in folds; and it often exhibits a double cutaneous ring, one within the other. The cord detaching itself in a circular manner, the umbilical circle becomes loose, forming a funnel-shaped hollow, at the bottom of which the cord may still be held by one or two vessels which soon separate. In this hollow

will be found the ruptured extremities of the vessels, surrounded by cellular tissue, and maintained on a level with the aponeurotic circle which the *linea alba* forms at this point by a continuation of the *fascia transversalis*. All these parts sink gradually towards the cavity of the abdomen, the cause of which may be seen in the following explanation. The umbilical arteries and vein have, until the period of birth, partaken of the general growth of the body, but from that moment they become inactive, receiving no more blood, the diameter and length at the same time evidently beginning to lessen. The rapid growth of the infant during the first days of its existence, the increasing development of the parietes of the abdomen, continually enlarge the space between the umbilicus and the termination of the umbilical vessels, the latter not undergoing development in a corresponding manner, they draw, as we may say, towards themselves the abdominal ring, which, although projecting and conical at first, soon presents a depressed and funnel shaped surface. This force is counterbalanced by the aponeurotic ring of the *linea alba*; there is then formed, according to M. Denis, a kind of sac, at the bottom of which appears a species of suppuration, not to be confounded, however, with that resulting from the disorganization of the base of the cord in certain cases. The cord at its insertion is often perfectly dry, whilst the funnel-shaped hollow of the umbilicus forms the suppuration to which we have just alluded. It is entirely different in composition from ordinary pus, the result of inflammation; at first the skin about the umbilicus, always a little excoriated at the place of separation, becomes a kind of mucous membrane secreting a puriform fluid, and the cellular tissue at the same time secreting pus. In the centre of the umbilicus is seen a soft tubercle more or less red, formed by the extremities of the vessels re-united, which disappearing by degrees, is at last imbedded in the abdomen. Sometimes this tubercle inflames, becomes fungous, and forms in the centre of the cutaneous ring an excrescence requiring cauterization. The umbilical vessels form, at their point of union an angle which opens in proportion to the retraction of the umbilicus, and when the hollow is deep, the skin, gathering in a circular manner, unites with much more facility as its borders are a little excoriated, and an adhesive inflammation is here formed. At this time the skin exhibits a cicatrix crossed by several small white lines at the point of its union; continuing without alteration during life. The skin appears to be drawn to the bottom of the umbilicus by means of the cellular adhesions which

unite it at the lower part of the sac with the umbilical vessels, and these adhesions becoming closer and more solid at the internal surface of the cutaneous fold, it is thus constricted in all its circumference by the aponeurotic circle of the *linea alba*.

When the cicatrization at the bottom of the umbilicus is completed, the umbilical ring assumes internally a new form, it is no longer circular, but has two edges,—the one superior, often very thick; the other inferior, and almost always thin. It becomes crescentic in its shape, the convexity of one border corresponding with the concavity of the other; by which a semi-circular hollow is formed in the centre of the umbilicus, the concavity of which has sometimes a superior and sometimes an inferior aspect; more frequently however the latter, as the drawing of the umbilical arteries is much greater than that of the vein. The progressive growth of the abdomen, its fat or lean condition, etc., often modify the shape; but such is the original form of the umbilicus in most cases. When it is so found in the dead body, and should there also be at the umbilicus a puriform oozing, we may infer that the separation of the cord had been recent. M. Denis has described two circles; one, which surrounds the cord before its separation, by the name of the temporary cutaneous ring, and that which remains during life by the appellation of permanent ring. This distinction is quite proper, but he has erred in calling the form circular; it is such as we have above described. The two opposing edges are evidently the effects of the drawing of the umbilical arteries and vein in opposite directions. This drawing is ordinarily greater at the lower than at the upper border, and the superior edge is almost always observed to cover the inferior.

From the 10th or 12th day the cicatrization is complete, and the oozing from the umbilicus ceases; this, however, varies considerably. The cicatrix is sometimes closed sooner, and the form of the umbilicus is one of the causes of the length of time required for its accomplishment. If the ring be thin and the cord small, it is very soon effected. If, on the contrary, the ring be voluminous, and extend very much up the cord, the retraction and cicatrization are much more slow in their progress. Thus, when a cicatrized umbilicus is observed in an infant, we should bear in mind these differences in the umbilical ring. In general, when the ring is thin and the cord slender, the desiccation and separation of the cord and the cicatrization of the umbilicus will terminate before the 10th day. If we meet with a very projecting umbilicus, as it corresponds probably with a

thick cord, we may conclude that the cicatrization was not completed until after the tenth day. A variety of pathological causes, such as inflammation, hernia, or certain monstrosities, may retard the progress of the cicatrization, or cause it to be varied in form. Upon examining the centre of the normal umbilicus with attention, a sort of hardened tubercle will be seen, produced by the obliterated extremities of the arteries and vein united. As the infant advances in age, this space becomes narrower, the tubercle and the umbilical centre sink inward, the edges of the cutaneous ring approach, and become almost in contact, while a true cicatrix forms, and solidifies on a level with the vascular tubercle, which retracts more and more drawing to it the irregular centre of the umbilical cicatrix.

BLENNORRHœA OF THE NAVEL.

In fat navels, or in consequence of uncleanliness of, and maltreatment of the new cicatrix, says Vogel, it begins to discharge after the manner of mucous membranes. When this condition has lasted for some time, small excoriations begin to appear upon the abdomen, the whole surrounding integuments become inflamed, and painful to the touch, and a small round ulcer, of the size of a nickel" forms. The discharge may be very persistent, in ill-nourished subjects. I met this trouble once in a fully developed woman who was predisposed to phthisis.

Treatment.—This catarrh of the navel is very apt to be neglected and therefore very persistent. The application of tepid water compresses will usually arrest it. It may be necessary to add *Calendula*, (three drops of the tincture to a gill of water). *Silicea* is indicated if the discharge is thin serum, *Arsenicum* or *Sulphur* if there is a tendency to excoriation. *Arsenicum* cured the case of the woman mentioned above. If ulceration supervenes see treatment thereof. Dr. J. C. Morgan of Philadelphia recommends the use of white sugar to arrest the process of ulceration.

THROMBOSIS AND INFLAMMATION OF THE UMBILICAL VESSELS.

Thrombosis of the umbilical vessels according to Steiner, is a process which may be simply physiological or partly of pathological importance, and in some cases has an intra-uterine origin. The arteries are more frequently affected than the veins. Wrany, (Steiner, p., 303) in the investigation of 120 infants, found thrombosis twenty-three times in the arteries and only three times in the veins.

The thrombosis may, however, extend into the hepatic radicles of the portal vein, or through the ductus venosus into the lower vena cava or into the arteries as far as the fundus of the bladder, or even into the cavity of the pelvis. The cause of such thrombosis is not clear.

When the infant is in a healthy condition, clots always form in the umbilical vessels from the navel inwards. In time these are absorbed without giving rise to trouble, but when the infant is in a low condition and these clots decompose instead of being absorbed, plebitis or arteritis is liable to be set up. The entrance into the vessel of purulent or decaying matter from the fossa of the umbilicus, is very apt to set up inflammation of these vessels. By pressing along the abdominal wall toward the umbilicus, a few drops of pus may be squeezed out. The navel is liable to be extensively involved at the same time.

Owing to the pain and inflammation, the children are very restless, exercise the abdominal muscles as little as possible and invariably lean forward.

This is a serious disease, for the pus with particles of disintegrated fibrin is apt to pass into the general circulation, and lodging in distant parts, give rise to embolismal inflammations. Smith records several sub-cutaneous inflammations and points of embolismal pneumonitis in an infant he attended. "The family," he said, "were highly scrofulous and prone to scrofulous inflammations"—a not very scientific expression. As this is essentially septic poisoning, it is most frequently met in lying-in institutions during the prevalence of puerperal fever. It is also often met in foundling's asylums. In severe cases death usually closes the scene at the end of the third week.

When exceptionally, no purulent absorption occurs, the discharge grows less and then after several weeks, becomes firmly cicatrized.

Treatment.—Smith advises that the pus be gently squeezed out and the infant placed with the umbilicus dependent, so as to aid its escape by gravity. The fossa should be kept clean by dropping warm water upon it several times a day, in which is a little *Carbolic acid*. He advises that a warm soft poultice be applied to the abdomen, but it seems to me that unless the inflammation is very severe, poultices should be avoided as tending to hasten and promote suppuration. A compress wet in warm water, may be used in which is put the indicated medicine. The first remedy to be thought of, is *Aconite*. If the inflammation seems to extend up the vein, *Hamamelis* will be indicated. If emaciation rapidly supervenes with symptoms of pyæmia,

Arsenicum will occur to the mind. Other remedies as *Belladonna*, *Hepar sulphur*, *Apis*, may be indicated both from the local and constitutional symptoms. This condition of the vessels may set in as a complication of some other disease, as jaundice, indigestion, gastric or intestinal, etc., and in such cases, as well as in all others, the totality must decide the choice of remedies.

INFLAMMATION AND ULCERATION OF THE UMBILICUS.

Inflammation of the umbilicus is a flag of distress flung out by a disordered system, which sometimes occurs in the new-born about the time of the detachment of the cord, or soon after. It probably results from uncleanliness or carelessness in the management of the cord, by which irritating and decomposing substances remain in the umbilical fossa. Sometimes decomposing particles from the cord are the probable irritants. This disease (Smith, p. 67), is also apt to occur in cachectic infants, or those of scrofulous parentage, whose general condition renders them liable to inflammations. Steiner says it may be due to chemical or mechanical irritations, or to pyaemic or other septic infection. The umbilicus becomes red, slightly swollen, and moist by the secretion. Often the inflammation continues two or three days in this mild form, with no treatment except that from the nurse by washing and a free use of her dusting powder. Usually the inflammation is severe and extends over the abdominal walls for several inches, the umbilicus becomes swollen and infiltrated. An ulcer soon makes its appearance involving the whole navel or the wound may be covered with croupo-diphtheritic exudation. The discharge may be bland and slight, or quite profuse and ichorous. If the child is in fair health and has proper care, the inflammation may gradually abate and the ulcer heal, leaving a cicatrix in place of the normal umbilicus. But if the infant is decidedly cachectic, the ulcer may extend out on the walls on all sides, and dip deep into the tissues beneath, till finally, in the worst cases peritonitis occurs, followed by perforation, which is apt to result fatally.

Dr. Mildner of Prague (Schmidt's Jahr b. No. 7, p. 64, 1848, West. Diseases of Children), examined forty-six fatal cases of inflammation of the umbilicus and its vessels, in children born in the Lying-in Hospital. Congestion of the liver, impairment of its functions, and icterus, were among the symptoms present, as well as in many cases, peritonitis, inflammation of the abdominal integuments, purulent infection of the blood and the formation of abscesses in joints, which occurred thirty-three times, while in four cases, haemorrhage took place

from the umbilicus. convulsions occurred in only five. These convulsions in no instance, in the least resembled those characterizing trismus.

In some cases of peritonitis, a discharge of a sero-purulent fluid takes place from the umbilicus. West reports one case where inflammation of the sinuses of the dura mater, and peritonitis, appeared as a sequelæ of scarlet fever, in which for several days from a quarter to half pint of pus discharged from the umbilicus daily with benefit to the case. Several cases of recovery are recorded.

Haemorrhage may result from infantile jaundice, if present, before or during the separation of the funis. West says that in some instances the recurrence of this bleeding proves rapidly fatal, while in others, the infant sinks into a state of coma, which continues for a day or two before death takes place.

Treatment.— When the inflammation is at all severe and the constitutional symptoms marked, as especially when extensive ulcerous destruction of the navel tissue is involved, the prostration will be great and the vitality rapidly exhausted. In such cases, Smith advises three or four drops of brandy, to be given every hour or two in the breast milk.

The simple inflammation may be controlled by *Aconite*, when the fever is high, or with the local use of *Calendula* when there are few, if any general symptoms. Where the tendency is toward ulceration, then the general system should receive the attention.

Guernsey says; “For ulceration of the umbilicus *Arsenicum* generally suffices. Study also *Apis*, *Lachesis*, *Lycopodium*, *Sepia*, *Silicea*, *Sulphur*.”

Other remedies, as *Mercurius*, *China*, etc., may be called for, by the totality of the case.

GANGRENE OF THE UMBILICUS.

Under unfavorable hygienic surroundings, the system of the infant being vitiated, the umbilical ulcer instead of cicatrizing, takes on inflammation, and finally becomes gangrenous. If the system is rapidly prostrated, gangrene may supervene on the hitherto healthy stump, without the formation of an ulcer. The prognosis is in any case grave. If a dark brown slough occupies the site of the umbilicus and a sero-sanguineous discharge exudes from underneath, the common result is perforation, peritonitis, and death in from one to two weeks.

Treatment.—When gangrene threatens to develope, Smith advises that the parts be bathed frequently with *Carbolic acid* and a cloth applied to the umbilicus. Powdered charcoal is a good application as well as a valuable disinfectant. The remedy above all others that will be indicated, as a rule, is *Arsenicum*. *Lachesis* also has a specific relation to gangrene. *Kali permanganate* is a valuable remedy and disinfectant. The decaying mass or slough should be detached as soon as it is so far separated that hæmorrhage will not follow. The parts may then be bathed with *Calendula* lotion. The after-treatment will then be the same as for ulceration.

UMBILICAL HÆMORRHAGE.

Profuse and even fatal hæmorrhage may occur at birth or soon after, from insufficient ligation of the funis, or from laceration or other injury such as tearing the umbilical arteries off just as they emerge from the abdomen. Bouchut details a case where death occurred before birth from rupture of the cord. The funis was short and traction of the forceps broke it, and the bleeding was so profuse that the infant was exsanguinated when delivered. The fungoid granulations to be described sometimes cause distressing hæmorrhage when injured.

Besides these accidental forms of bleeding, there is a constitutional form of umbilical hæmorrhage which is a very grave malady. Cases were observed and recorded for more than a century. One of the first on record was reported in the "Gentleman's Magazine" April 1752, by Dr. Watts of Kent, England, but little was done in a systematic way to solve its nature until Drs. Francis Minot, Stephen Smith, and I. Foster Jenkins, made it a special study and published monographs upon it. The first contained the statistics of forty-six cases and was read before the Boston Society for Medical Improvement in April 1852; the second contained a record of seventy-nine cases and was published in the New York Journal of Medicine in 1855, while the last and most exhaustive monograph contained the record of 178 cases, and was published in the *Transactions of the American Medical Association* for 1858. These three papers contained nearly all that is known in reference to this disease. We here present a summary of the facts given.

Sex, Age.—Females seem less liable to this hæmorrhage than males. In the 178 cases 34½ per cent were females, and 65½ males. The date of occurrence in ninety-nine cases were: Under one day five, under two days seven, under three days six, under four days three, from five to seven days inclusive thirty-two, eight to ten days twenty-five,

eleven to fifteen days sixteen, sixteen to twenty-one days four, at the fifty-sixth day one. Total ninety-nine. It will be seen that most of the cases occurred at the time of the separation of the cord. In some cases the haemorrhage occurred while the cord is still adherent, but usually it commences soon after the separation of the funis.

Causes.—A feeble coagulability of the blood is the usual proximate cause. In ordinary cases the umbilical vessels are plugged up by coagulated fibrine of the blood, which is so well organized by the time the cord becomes cicatrized, that haemorrhage is impossible. But when the vitality is low, the clots are so soft and the vessels so patulous that the blood oozes through them from its pressure. This lack of fibrin is easily demonstrated, for if a little blood, as it escapes, is caught in a vessel, it will be found to remain a long time liquid.

The dyscrasia which we have recognized as a chief cause of the haemorrhage, does not have the same origin in all cases. It is in some cases syphilitic. The infant may be plump and appear well at birth, but in most instances it is puny and cachectic, with local manifestations of the disease with which it may be affected. In a case recorded by Smith, the infant was puny, premature, and had several blebs of pemphigus on the first day, from which the blood soon began to ooze, but the fatal hemorrhage did not occur until after two weeks. In about one-fifth of the recorded cases, ecchymoses or petechiae have been observed upon various parts of the surface, showing constitutional dyscrasia.

Jaundice is another cause of umbilical haemorrhage. All the writers remark the frequent occurrence of the icteric hue, both before and during the bleeding, Smith says that "it is not improbable that in certain instances the jaundice arises from destruction of the red corpuscles, and liberation of the haematin, a not unusual result of a profound dyscrasia, whether syphilitic or originating in some other cause." In most instances the jaundice proceeds from the liver. In five cases recorded by Jenkins, there was occlusion of the hepatic or common bile duct, and jaundice from the presence of biliary acids in the blood, causing a diminution of the alkaline elements, particularly the fibrin and corpuscles. In great acidity of the system, rendering the alkaline elements deficient, there is a predisposition to haemorrhage.

Poor health of the mother and impoverishment of her blood during gestation, whether from chronic disease, as tuberculosis or anti-hygienic conditions also cause impoverishment of the alkaline elements of the blood, and is therefore a cause of haemorrhage. One

severe case I attended, the mother had profuse haemorrhage at the seventh month. The child was consequently small and impoverished, and cicatrization of the stump, tardy and imperfect.

The excessive use of diluent drinks or alkalies by the mother, is believed by some to have a similar effect. Simple diluents in excess, might render the blood so fluid as to be difficult of coagulation, but I cannot see how the alkalies will predispose to haemorrhage unless by saponifying the fats of the blood and tissues.

A haemorrhagic diathesis is a cause in certain cases. In the cases recorded by Jenkins, nine^f of the mothers were subject to neuralgia and puerperal haemorrhage and to bleed easily and freely from injuries; and seventeen other mothers had each lost more than one infant from umbilical haemorrhage. In those cases in which the haemorrhage commenced before the detachment of the cord, and extend to its point of insertion, the haemorrhagic diathesis is believed to be the main cause of the flow.

The state of the vessels when the cord drops off, is another cause of this form of haemorrhage, although the majority of the cases is doubtless due to "a vitiated state of the blood;" Sir James Y. Simpson and others have met cases referable to this state of the vessels. To close the vessels effectually by the fibrinous coagula, the walls must have their normal contractility; this may be impaired by an enfeebled body or by inflammation. Inflammation whether of the arteries or veins, causes thickening and infiltration of the parieties, loss of tone of the fibrous walls, and therefore a patulous state of the vessels. Moreover the inflammation is apt to be suppurative and the pressure of pus hinders the formation and continuance of a firm and effective coagulum.

Another cause may be mentioned and that is rude handling. One case that came under the observation of the author died from haemorrhage from the vessels within the abdomen, as the result of a rude shaking by a heedless girl.

Symptoms.—Haemorrhage before the cord separates, usually manifests itself as soon as the cord is ligated, by the disposition to ooze. When the cord is dressed, the physician should examine it carefully for oozing, either of blood or serum. Umbilical haemorrhage usually occurs without any premonition, but sometimes there is a preceding jaundice, sometimes there is great tardiness of separation of the cord, and when it hangs by a mere shred (walls of the vessels) it might be rudely torn off through rough handling. Faintness and pallor are

symptoms that arrest the attention of attendants. Rarely, colicky pains and vomiting precede the haemorrhage. Jenkins ascertained that jaundice was a prodromic condition in forty-one out of 178 cases, and with the icteric hue, constipation, clay-colored stools, deeply tinged urine, etc., were sometimes recorded. The blood oozes slowly or rapidly, rarely escaping in a jet, even when there is reason to believe that it is arterial. It may be arterial, venous, or both.

The Prognosis is unfavorable. Statistics show that five out of every six cases perish. The prognosis is most unfavorable when jaundice or purpura is present. The cases most likely to recover are those of a healthy parentage, and in whom the haemorrhage occurs late and is not profuse, and where there is no dyscrasia. The average duration of the haemorrhage in eighty-two fatal cases in Jenkins' collection, was three and a half days, the minimum being only three hours. Death may occur from exhaustion or the depraved constitution after the arrest of the haemorrhage.

The Treatment is both local and constitutional. The modes of treating the bleeding part have been various, viz., injecting styptics into the open vessels, applying a styptic by compress or sponge to the navel covering the navel with dry or wet plaster of Paris, constant pressure with the finger, a tedious process, and lastly the use of needles with ligature. All of these methods have been more or less successful in arresting the bleeding, but the last is most effectual, though painful. Two needles are passed through the umbilicus at right angles, and a waxed thread wound round each in the form of the figure of 8. In four or five days, the needles should be removed, and a poultice or simple dressing applied. The constitutional treatment is important. As the bowels are apt to be constipated, the Allopaths advise a laxative, not only for its effect on the liver, but also as a derivative, and both Smith and Jenkins recommend *Calomel* for this purpose. The Homœopathic treatment considers the totality of the case. In one case where the blood was dark, *Hamamelis* arrested. In another where the mother had profuse haemorrhage before labor (controlled by *Belladonna*) in this case *Persulphate of Iron* was used as a styptic, and from the shriveled, enfeebled condition of the infant and the disposition to repeated returns of the bleeding, *Arsenicum 6* (a dose every two hours) controlled the case nicely. Where the blood is bright, coming on suddenly, attended by colic, *Belladonna* is indicated. If the flow is dark and the parts œdematosus, *Hamamelis*. If the urine is strong like that of an animal, *Nitric acid*. If there is nausea and faintness with the haemorrhage, *Ipecac* will be indicated; for the loss of blood, *China*.

FUNGUS UMBILICALIS (SARCOMPHALUS.)

Raspberry Navel.—This is a broad based pediculated excrescence that springs up after the cord has dropped off, and may attain the size of a pea. It arises from the exuberant granulations of the part, and hinders the formation of a cicatrix. The integument immediately surrounding it, is somewhat reddened or slightly excoriated and puffy. On opening the umbilical fold, the excrescence will be seen situated as above described, and sometimes bathed in muco-pus.

The treatment of this growth is best accomplished by throwing a ligature around it, pushing the noose well down to its base, and as the ligature is tightened, it cuts through the tumor; bleeding of the stump may be at once arrested by the application of *Lunar caustic*, and after the eschar has sloughed off the parts should be dressed with *Calendula cerate*.

AMNION NAVEL.

This is rarely met with ; it consists of an abnormally broad insertion of the sheath of the cord, and a corresponding defect in the skin of the abdomen. The children so affected do not live. Two cases illustrating this is given on pp., 26 and 111.

FISSURE OF THE ABDOMEN.

When this is complete, the cleft extends from the manubrium sterni, or it may vary in extent, being limited to the abdominal walls, or between the umbilicus and sternum. The cleft generally occupies the median line and it may be complicated with eventration, ectopia vesica, formation of cloacæ, spina bifida or other malformations which are incompatible with life. (Steiner).

When the deficiency in the abdomen occurs at the umbilicus, a hernia may take place of great extent, the contents of which, in extreme cases, may be a large part of the intestinal canal and even part of the liver, stomach, liver and spleen. In such cases life is impossible, but when only a small knuckle of intestine is included, a cure may be affected. This malformation must not be confounded with umbilical hernia which occurs after the separation and cicatrization of the cord.

Dr. Lawson Tait says :

"I have seen only one case of this malformation, and I did not succeed in benefiting the patient; but a further consideration has induced me to believe that if I had been somewhat more heroic in my treatment, the case would have had a more satisfactory ending. I saw the child in consultation, and it presented at the umbilicus, a huge mass, very like a large penis affected with a very severe gonorrhœa.

it evidently contained gut, and from several cracks on the covering, it was clear that the tissue of the cord, plus peritoneum, perhaps, though this is doubtful, constituted the sac. In our efforts to reduce the hernia, we ruptured the sac and the bowel protruded. We then saw that they were everywhere adherent to the sac, but that the adhesions did not bleed when torn. Neither of us had ever seen such a case and I could find no advice for treatment under such circumstances anywhere. We therefore covered the intestines and left the case to nature who ended it in ten days. I now believe that if we had boldly picked off as much of the sack as we could, returned the intestines, and stitched up the aperture, we should have done what was right, and might have saved the patient." (See case of Dr. Cheney on p. 26.)

ECTOPIA VESICÆ.

In cases where the umbilicus is at an unusually low level, the genital sinus is not closed, and between the umbilicus and pubis there appears a roundish and flattened, dark red tumor which may be recognized on examination as the posterior wall of the bladder, by the ureters opening upon it. The children are usually weakly and generally die early. The exposed mucous membrane becomes dry and skin-like, especially at the upper part, whilst at the lower surface, both skin and mucous membrane suffer from excoriation and ulceration from the constant dribbling of the urine. There is very little encouragement to be given for any treatment in the two preceding forms of fissure; in the latter, however, a plastic operation has sometimes proved successful.

UMBILICAL HERNIA (OSCHEOCELE).

Umbilical hernia may be either congenital or acquired. If congenital, or existing at the time of birth, it may result from deficiency of the abdominal parieties to a greater or less extent, leaving the abdominal viscera, in some cases, only covered by the peritoneum or entirely exposed in case of the accidental rupture of this membrane. This variety might properly retain the designation — *exomphalos* or *omphalocele*.

Again, a hernia into the tissue of the cord or at its insertion may be met with occasionally, as above described, and should always be thought of in ligating the funis at delivery (see pp. 26 and 111).

By far the more common variety of umbilical hernia, however, manifests itself within the first few months after birth and may therefore be considered as acquired, although we may well doubt whether the umbilical ring had ever fairly closed.

It is most often met with in premature or poorly developed children.

A considerable number are therefore generally met with among foundlings and in dispensary practice. It is evidently brought on by the umbilical opening being exposed to undue pressure, before it has become firmly consolidated. Such pressure would naturally result from rapid distension of the abdomen by fat, from colic, violent crying, straining, coughing, etc., or by the pressure of the tight bands so generally employed by nurses. The hernia manifests itself as a rather globular protrusion, ordinarily about the size of the end of the finger, which seems to be gaseous in contents, recedes readily on pressure and returns immediately upon its removal. The edges of the roundish or somewhat elongated opening can be readily detected by the tip of the finger. Strangulation seldom occurs.

The Treatment consists simply in preventing the escape of the viscera through this opening, as, if this can be fully accomplished, the umbilical ring will, in ordinary, recent cases, become occluded in the course of from three to six weeks.

Since the adipose tissue is wanting immediately around the umbilical ring, I prefer a pad sufficiently convex to fill the depression thus produced and keep the intestine back upon a level with the peritoneal surface. This a flat pad would not perfectly accomplish. For this purpose nothing is better than an ordinary wooden button-mold to be found in every lady's work basket; flat upon one surface, convex upon the other, about one inch or an inch and a half in diameter and not too thick. To hold this in place nothing can be more satisfactory, in cases of infants, at least, than a strip of good diachylon plaster, at least two inches wide, and long enough to go around the child's body and overlap two or three inches. Having warmed the plaster, lay the flat surface of the button-mold upon the centre of the strip, and while the child is held upright by the shoulders, apply the pad accurately to the navel, carry the plaster smoothly and snugly around the belly and allow it to overlap upon the back. Here it should be pinned or stitched so as not to slip. Over this the ordinary flannel band may be pinned and if the plaster is good and not wetted in bathing, it will not need to be renewed under three or four weeks. After the removal of the second plaster the case will usually be found cured. This plan of treatment is so simple and so uniformly successful, that any other will very rarely be required. A resort to operative measures for the closure of such herniae in children would scarcely be warrantable. In cases of the congenital variety first mentioned, characterized by deficiency of the abdominal parieties, the only practicable treatment

would usually consist in supporting the abdominal walls by adhesive plaster or some similar means, while the protruding tissues are carefully retained and protected by a suitable, unirritating compress, until the parietal tissues should be sufficiently developed to no longer require such artificial supports. (A. G. Beebe.)

Umbilical, or any other hernia rarely exists uncomplicated. There are usually constitutional symptoms or conditions that cause or aggravate the case. In acquired hernia, the exciting cause is almost always colic arising from indigestion. The predisposing case is the progressive development and consequent separation of the abdominal muscles at this most rapidly growing period of infancy. Under these circumstances remedies have been found indicated and valuable.

Hartmann says: "I have opposed Hahnemann's psora-theory with a good deal of firmness, and do oppose it yet in all cases which I am able to account for upon different principles with more satisfaction to myself; but in the case of hernia I frankly confess that the psora-doctrine seems to account better than any other, for the primary disposition to such weakness. When such a disposition exists, crying, coughing, flatulence, continual diarrhoeic stools, may easily cause a rupture. A real specific, not only for hernia but also for the chronic diathesis which leads to the formation of hernia, is *Acidum sulphuricum*, the 15th, 24th or 30th attenuation."

The remedies that have been found chiefly indicated by various physicians and authors are, *Nux vomica*, *Veratrum*, *Chamomilla*, *Sulphur*, *Silicea*, *Opium*, *Aconite*, *Belladonna*, *Plumbum*, *Lachesis*, *Arsenicum*, *Rhus*, *Acidum sulphuricum*, *Aurum*, *Lycopodium*, *Antimonium crudum*. The special indications given are as follows:

Nux vomica may be looked upon in every instance as the medicine of primary importance. "In cases in which the mechanical measures fail to complete the cure, the administration of this medicine," says Laurie, "will generally effect the purpose." It is indicated where respiration is difficult and obstructed. Where the appetite is inordinate and the food distresses, giving rise to colic soon after eating.

Veratrum is indicated where *Nux* fails. (Laurie.) Cold sweat on forehead from prostration.

Chamomilla.—If the child is very fretful and is quieted by carrying, the stools are green and frequent.

Sulphur.—In obstinate cases where improvement is arrested. If there is soreness of the navel and excoriations about the anus. The bilious vomiting changes to sour.

Silicea.—Where the soreness of navel is attended with a flow of profuse thin pus and *Sulphur* fails to help.

Opium.—When there is redness of the face; hard and distended abdomen (Williamson).

Aconite.—Feverish restlessness.

Belladonna.—Sudden starting; colic, abdomen over stomach puffed out like a pad; worse at night.

Plumbum.—Obstinate constipation with straining. Frequent, violent colic.

Lachesis.—The parts about the navel appear dark as if gangrene would supervene. The faeces have a cadaverous smell.

Arsenicum.—Diarrhoea attended by rapid prostration; restlessness; vomiting immediately after eating.

Rhus.—Worse at night and when being quiet, must be moved about.

Lycopodium.—Distension of the abdomen, worse from 4 to 8 P. M. Reddish-sandy or slimy sediment stains the diaper. Grayish yellow color of face. Constipation with urging to stool.

Antimonium crudum.—Alternate constipation and diarrhoea. Indigestion, tongue white, much vomiting but no thirst.

Other remedies may be indicated by the local and constitutional manifestations.

INFANT MORTALITY.

We have thus far traced the natural history of the infant up to the time of its independent existence. It will be very profitable for us to review the dangers passed, and those that are to come.

It is a justifiable opinion (Hartshorne, Public Health Reports, Vol. II, p. 211.) that amongst those born with a normal constitution, and under entirely favorable circumstances, the mortality during infancy and childhood *ought* to be *less* than at any other period of life. Yet it is a fact familiar to every one, that the reverse is the case in very many localities, most notably in large cities. In France, one-sixth of all born, die in the first year of life; in Sweden and Finland, one-fifth; in Berlin, Prussia, one-third. The proportion is about the same in England, and in this country the mortuary statistics of New York, Philadelphia, Boston, Chicago, San Francisco, and other cities, show a similar death rate. This fearful loss of life is very much lessened from what it was in former years in London.

	1730-49	1750-69	1770-89	1790-1809	1810-29
Total births,	315,156	307,395	319,477	386,393	477,910
Total deaths, under five years,	235,087	195,094	180,058	159,571	151,794
Dying, per cent under five years	74.05	63.00	51.05	41.50	31.08

century will witness a still further decrease in the mortality.

As Dr. Elisha Harris has remarked, summer is the *tentator infanticum*, the greater number of the deaths among children occurring during this season, and that mainly from "diarrhoeal diseases."

But the excessive mortality of early life is by no means accounted for by seasonal influences alone; other causes, also, are of great importance. These may be advantageously referred to as *ante-natal* and *post natal* causes.

Under the first belong, as we have seen, constitutional defects in parents, resulting especially from *alcoholism*, *syphilis*, *scrofulosis*, [so-called] congenital malformation and weakness, debility from *overwork* and *under feeding* in the poorer classed; in those more prosperous, excess of the nervous temperament, and *deficient organic development in women who become mothers*.

Upon *Alcoholism* as promoting brevity of life in offspring, it is not necessary now to dwell. It has been proved to be a very direct productive cause of disease, especially of developmental diseases. Drunkard's children are, as Baer has shown, often idiotic, deaf-mutes, or blind or epileptic, or they die early of convulsions, showing radical constitutional impairment.

Syphilis has been credited with a very large infant mortality. Dr. Sturgis, in the "*American Journal of Syphilography*," asserts that to

it are due 80 per cent of the deaths of children under five years of age, in New York and Philadelphia.

"*Scrofula* seems to be less frequent now, in Philadelphia at least, than thirty years ago. It is likely that with us, improved general hygiene and medical practice may have had to do with this change." Perhaps more is due to more accurate diagnosis. "This is not the place to consider the question whether scrofulosis, so called, and tuberculosis are or are not one, and whether or not phthisis is essentially a tubercular affection. My belief is that struma and tubercle are modifications, only, of the same diathesis."—(Hartshorne.)

Consumption of the lungs is not common amongst children in our American cities; it is more so in those of Great Britain and on the continent of Europe; but other forms of analogous or related disease destroy through *marasmus*, *tubercular meningitis*, etc., a large number of young, here as elsewhere.

Amongst the causes of early mortality acting through parents, we may mention excess of the *nervous temperament*, and *deficiency of organic development* in women. It might be safe to say in *men and women*. Both *run to brain and nerve* too much in this country. Animal functions are less readily subordinated to the intellectual and moral nature, but all these not too largely the vegetative, nutritive, and reproductive systems. This Hartshorne believes by close observation to be the secret of the lessened and lessening number of births of American children of native parents, compared with those of foreign parentage. Much more remains to be investigated upon this subject. In Massachusetts, however, the mortality of infancy is greatest among the children of foreigners.

Post natal causes of infantile mortality differ in different climates. Northern cities lose many infants in the winter, by pneumonia, capillary bronchitis and croup — under the exposure to cold so often connected with poverty and neglect. Nothing in our mortuary statistics is more constant than the proportion between the number of deaths amongst young children and the excess of the daily temperature above 95° Fahrenheit in the shade; indeed we might safely say above 90°. But along with this positive cause of disease, taking effect most severely upon the infant population, must be apprehended and remembered also the action of *impurity of atmosphere*. Cholera infantum is very greatly promoted and made fatal by this cause. So also are the disorders of the nervous system which produce convulsions. And this is no doubt almost equally true of some affections of the colder season; as pneumonia, bronchitis and croup. In adults it has been well established that *close living* is a powerful promotor of bronchial and pulmonary inflammations, as well as of phthisis in all its forms.

Every zymotic disease is rendered more fatal, if not more prevalent, by foul air. Any sanitarian might designate in a city what wards, blocks, courts, alleys and houses, will always afford the largest number of deaths from scarlet fever, measles, and cholera infantum from year to year, and from diphtheria, cerebro-spinal fever, typhus or cholera Asiatica, when either of these prevail.

The great importance of impurity of the atmosphere as a factor in the mortality of infants in large cities, has been fully recognized in times past. There seems to be some ground for fear that it may be, at the present time, too little borne in mind, under the almost overshadowing attention given to another factor, itself truly of great consequence—*bad feeding* of children. The effect of bad air is exemplified by the records of the Dublin Lying-in Asylum, in which during the twenty-five years of its existence the infant mortality was such that nearly every sixth child died within two weeks after birth. The adoption of better sanitary measures, by which the wards were rendered more airy and more easily kept clean, reduced the death rate 1 in 19 $\frac{1}{2}$, and still later improvement in ventilation, etc., lowered the number of deaths to 1 in 58 $\frac{1}{2}$.

Errors in infantile *diet* may be considered briefly, as they occur: First, when the child is suckled, in part or together, by the mother or a substitute; second, when it is fed entirely by hand or with the bottle. Insufficient or improper clothing is also an essential factor in the production of disease and death.

Feeble mothers cannot often although they do sometimes, rear healthy children. Women obliged to work hard, and sometimes to leave their infants for many hours together, neglect them, almost or quite unavoidably to their great detriment. Weaning occurs thus prematurely and privation of natural food invites early death. At the opposite scale of society, in some countries, most of all in France, but to a small extent only in America, indolence and luxury amongst the rich induce mothers to thwart the instinct of maternity by placing their offspring under the care of hireling nurses, often away from their homes. The large mortality of children so treated has, for a number of years past, attracted the serious attention of French physicians and sanitary observers, it having been estimated that one-half of the nurse children of Paris perish during their first year. The same sort of evil is intensified fearfully in foundling hospitals, whose death-rate has always been immense. During the first year of the New York City Foundling Hospital (1869-70), 55 per cent. of all admitted to it died. This was comparatively moderate. In some of the foundling asylum the mortality reaches 80 to 90 and even 100 per cent. In the Dublin Foundling Hospital, during the last century, according to Sir James Simpson, of 12,000 infants received, only 135 lived. An improvement upon this was certainly witnessed, when, from 1795 to 1826, of 52,000 admitted only 41,000, about four-fifths died. The mortality in the Chicago Foundlings' Home has been 50 per cent.

The diseases which are especially destructive to young children in our great cities are cholera infantum, small-pox when vaccination has been neglected; cerebro-nervous disorders, with convulsions, pulmonary inflammation, croup, diphtheria, when the latter is epidemic; cerebro-spinal meningitis, when it is locally prevalent and marasmus. Some cities in the old world receive very large additions to the mortuary causes, from rickets, tetanus neonatorum and other affections which although they occur here, are of less comparative frequency.

DISEASES
OF
INFANTS AND CHILDREN.

PART II.

DISEASES
OF THE
DIGESTIVE ORGANS.

A GENERAL SURVEY.

When studying the extensive digestive system and its many diseases in detail, we must not overlook the great importance of a general survey of this tract in each child. From the general to particulars is logical order of study for most minds.

There are well marked external signs of the general condition of the digestive organs, familiarity with which will enable us to "see right through" any child. A plump vigorous child is a pleasing evidence of the normal development and activity of the digestive and assimilative apparatus; but a small, scrawny, nervous child on the one hand, and a flabby, stupid one, on the other, are abnormal conditions that demand our most skillful attention. The scrawny child will struggle with colic from acidity, while the flabby infant will have obstructive troubles from excess of alkalinity. The mucous membrane of the lips in the first case will be thin and excessively red, while in the second it will be thick and pale. These are a few general facts full of significance to the close observing practitioner.

SHAPE, GLANDS AND SECRETIONS.

The alimentary canal is peculiar both from its shape and from the great variety of glands that pour their varied secretions into its moving contents.

Shape.—The funnel shaped mouth; the flattened pharynx; the narrow œsophagus; the dilated stomach, tilted up into the left hypochondrium, half bent upon itself; the narrow looped duodenum; the tortuous jejunum and ileum, terminating at right angles with the dilated and dilatable colon that arches the abdomen from ilium up, across and down to ilium, then bent abruptly on itself forming the sigmoid, and now narrowing to form the rectum, closing firmly by two constrictions at the anus; these are all points of special importance.

The mouth changes with the forward and lateral bony development, from an oval with a depressed palate to aid suction, into a concavo-convex cavity which crowds the food under the teeth.

The pharynx increases in size with the development of the child from a flattened to a triangular cavity. The longitudinal fibres of the oesophageal muscles become better developed so that choking is not so liable. The stomach, from the shrinking of the left lobe of the liver and its own development, drops more horizontal, while the ileum is relatively shorter, aided, no doubt, by the firm, rapid and persistent circular contractions during early childhood. The colon becomes more distended by its slow digestion as well as by the more solid character of the contents. The sigmoid flexure is greater, and the rectum, from firmer contractions of its sphincters, becomes more reliable.

The muscular development of the circular fibres predominate in the oesophagus, duodenum, jejunum, ileum and rectum while the longitudinal fibres are best developed in stomach and colon. The folds of the mucous membrane of the oesophagus, pylorus and rectum are arranged longitudinally while those of the stomach and intestines are formed horizontally. This membrane is one vast net-work of blood vessels and protruding lacteals while that wonderful sympathetic nervous system, like an immense system of electric coils, keeps the functional activity of this tract at its highest tension, continually.

The glands that empty their secretions into this wonderful tract are many. At its inlet we have the sublingual, submaxillary, parotid and buccal glands that pour out a profuse alkaline current to mix with the ingesta, which encounters in the stomach a very profuse acid secretion from the mass of gastric follicles. This combination of food with first alkalines and now acids, meets in the upward bend of the duodenum the large alkaline stream formed by the junction of the biliary with the pancreatic juices; on it rushes to be swollen by the secretion from the many intestinal mucous glands to a torrent of gushing stools, were it not for the absorption by the multitudinous capillary and lacteal vessels. Its fluid character in the jejunum becomes changed by this absorption in the ileum to semi-solid and to a still greater consistence (solid) in the colon. The foecal excretion in the latter no doubt aids the formation of this solid character. Here the reaction is again acid.

It is observed that a marked alkalinity is the normal condition of the contents of the alimentary canal in infancy. Neither the salivary,

nor gastric juices are profuse, therefore digestion is, at this early stage of life, chiefly intestinal. The large liver filling quite one-third of the abdomen give us a profuse flow of alkaline bile. If this is deficient, from obstruction, or is changed, and the gastric juice profuse, acidity is developed high up in the bowels giving rise to colic and all its attendant evils.

This general survey is very important in every case. If all parts are well developed and working normally, a vigorous digestion and a healthy child is the result, but if one set of glands are better developed than another, derangement and disease will be most surely encountered, sooner or later.

*THE PECULIARITIES OF DEVELOPMENT.**DEVELOPMENT DURING INFANCY.*

An acquaintance with the physiological condition of the different portions of the body, and the successive and rapid changes which they undergo, in organization and function, from the period of birth until that of puberty, is also essential to a correct understanding of the pathology and therapeutics of infancy and childhood. It is to the physiological condition of the several tissues and organs—their successive development and relative activity—that the predisposition to particular forms of morbid action, as well as various modifications which the phenomena, march, and termination of disease exhibit, in the earlier stages of existence, are to be attributed, and to which also reference is to be had, to a certain extent at least, in the choice of therapeutic agents which are then employed.

When the human being enters upon a separate existence, it presents physiological as well as physical characters, which it preserves during a certain period, altogether distinct from those which are proper to it in the subsequent periods of life. All of the organs are imperfectly developed, while many of them are, as yet, merely rudimental; and the whole of the functions of life are confined, almost exclusively, to those of nutrition. By degrees, however, the different parts of the system become more perfectly organized, the body increases in size, and exhibits an augmentation of strength and vigor; organ after organ becomes successively developed, and enjoys for a time a predominance of activity; the number and extent of the vital phenomena are thus increased, until finally the entire organism is adapted to the active regular performance of all its functions.

During the whole period of infancy, the activity of the digestive and nutritive functions, the great and rapid change of material which the different organs experience and the consequent demand for a constant supply of appropriate nourishment, render, under the influence of various disturbing circumstances, the occurrence of errors of nutrition, as of disease dependent upon deficient or improper food, of frequent occurrence. The great size and vascularity of the brain, also the extreme delicacy and excitability of the skin and mucous

membranes, and the great development of the whole lymphatic system cause these parts more frequently than others, to be the seat of serious and extensive disease. Their susceptibility being still more increased somewhat later by the process of dentition. The rapid development of the brain, and the activity of many of its functions, as well as the simultaneous changes going on in the intestinal mucous membrane, as the teeth make their appearance, render both at this particular period, especially prone to disease from slight causes.

The excessive nervous excitability of the infant gives to its diseases a peculiar character of mobility, that is to say, morbid irritations occurring in one organ are quickly reflected upon others; and from the great vascularity of every part, especially the abundance of arterial capillaries with which all are supplied, during the progress of rapid growth, sympathetic irritations become very soon converted into organic disease.

The digestive organs, though less perfectly organized in the early period of infancy than they subsequently become, are, nevertheless, in a condition adapted to produce rapid changes in the aliment introduced into them, and thus to afford a constant supply of materials for the nutrition of the system.

The mouth, with the exception of the teeth, is well formed, and, by the disposition of the lips and palate, and the obliquity of the posterior nares, is especially adapted for the performance of its proper office of suction.

The mucous membrane, throughout the whole tract of the alimentary canal, is thick, soft and villous — more plentifully covered with mucous, as well as more sensitive and vascular than in after life. In the stomach, duodenum, and jejunum, it is of a bright rosy color, but somewhat paler in the ileum and remaining intestines ; it often exhibits on different parts of its surface large yellow patches owing probably to the action of bile.

When all the liquid parts of the intestinal tube, in early infancy, are removed, there remains a layer of thick mucus, adhering closely to the internal surface. It may be raised by the nail, under the form of a pellicle, resembling, to a superficial observer, portions of the mucous membrane itself. This layer never remains but a short time after birth, detaching itself by a kind of natural exfoliation. This exfoliation occurs in very thin laminæ, which being rolled together form the small, flocculi, so frequently met with in the stools of young infants. When the surface of the duodenum or jejunum is colored with bile.

the removal of this layer of mucus removes also the yellow stain. (Billard).

In the infant, the stomach is much more conical than that of the adult, the entrance of the oesophagus is situated near the left extremity. The short curvature is comparatively long, and the large curvature but little developed. It is in consequence of this form of the stomach that vomiting is so frequent and easy in the infant. The stomach is placed in an almost perpendicular direction, extending from the left hypochondrium downward and backward in place of more transversely, as in the adult. The omentum is peculiarly delicate and entirely devoid of fat. The small intestines in the infant are nearly one-third longer in proportion to the whole tract, than in the adult, and the large intestines are longer in proportion to the small, but their calibre is relatively less.

The valvulae conniventes are scarcely apparent; some separate mucous follicles, about the size of a pin's head, and of a white color, often exist in the jejunum, and in the ileum, follicular plexes, white and projecting, and often with a slight black point on the top, as in the adult. The cœcum is largely developed and the vermiform process very long. The ilio-cœcal valve slightly projects, while the opening it surrounds is so extremely small, that, in most infants, it would be difficult to pass through it even a crow quill. At this age it prevents the regurgitation of substances, and even gas, from the large into the small intestines, but allows a free passage for the contents of the small intestines into the large. (Billard). The depressions and prominences of the cœcum and colon are less marked in the infant than in after life. The lacteal vessels and mesenteric glands are largely developed.

In the infant the liver has a bulk greatly disproportionate to the residue of the abdominal organs, at birth it fills quite one-third of the abdominal cavity, descending even to the crest of the ileum and across beyond the median line, crowding the stomach up under the left lung, but with the change in its circulation, caused by the obliteration of the ductus venosus and the development of the portal vein, its bulk diminishes, by a reduction, especially, in the size of the left lobe. The gall bladder is small at birth but soon enlarges; it contains bile of a green color, but less viscid, and containing less of its peculiar principles than at a more advanced age. The spleen is smaller in size, but presenting no apparent difference from its usual structure in the adult; it can be distinctly felt in the infant, under the ribs, towards the center of the abdomen.

During the entire period of infancy, the digestive and nutritive organs maintain their predominance. From the first month the jaws gradually expand; and between the sixth and seventh months the first teeth make their appearance, and by the end of the second year, when the first dentition is completed, each jaw contains ten.

During the progress of dentition, the mucous follicles and glands of the stomach become developed, and by the termination of the first year the several portions of the digestive apparatus have acquired, very nearly, their complete organization, and differ but little from those of the adult. The disproportion in the size of the liver, especially of its middle lobe decreases gradually; it recedes more towards the ribs and its parenchyma becomes of a darker color. The gall bladder augments in capacity and the urinary bladder assumes more of an avoid form and sinks lower into the pelvis.

Soon after birth digestion commences, and during the entire period of infancy is peculiarly active, demanding an almost constant supply, furnished by nature in the breast milk of the mother. This food, which is the only kind adapted to the peculiar condition of the digestive organs in the earlier months of infancy, increasing in consistence as the energies of the stomach become more developed, is fully adequate for the support of the system, until the commencement of the first dentition, when a more substantial ailment would seem to be required. The appearance of the teeth and the augmented size, and the greater activity of the salivary glands and the increased bulk of the muscles of mastication, enable the infant after the first year to partake of more solid food, which the stomach then digests with facility. The whole of the functions concerned in the nutrition of the system are equally active with those of digestion. The process of assimilation predominates considerably over that of decomposition, as is evinced by the constant growth of the body and the rapid development of the majority of the more important organs.

The discharges from the bowels are frequent, and pass almost involuntarily. In the earlier period of infancy they differ from those in after life, by their lighter color, their curdy appearance, and by the absence of any decided fetor. After the first year they become less frequent, darker colored, and exhale a stronger odor. They are then, also, under the command of the will.

Hunger and thirst and the instinctive desire for constant admission of fresh air into the lungs, are among the internal sensations which are first experienced; they have in infancy the same general characteristics that they exhibit in after life.

DEVELOPMENT DURING CHILDHOOD.

The whole of the vital functions proceed rapidly during childhood towards their complete development. Digestion is still extremely active,—almost every species of wholesome ailment is rapidly converted into chyme by the stomach; the appetite is acute, and a frequent and plentiful supply of food is demanded. The sense of hunger is more imperious and less easily controlled at this age, than at any subsequent period of life. Thirst, or a desire for aqueous diluents, is more frequently experienced during infancy as well in consequence of the more solid and stimulating character of the food that is eaten, as from the greater waste of the watery portion of the blood, by the active muscular exercise to which the child is prompted by an instinctive impulse.

Nutrition is equally active with digestion,—assimilation still predominating over decomposition; and hence the body continues to increase in size. The number of years that have elapsed since birth does not afford always a positive indication of the physiological condition of the human body, nor of any one of its organs. Climate, moral and physical education, diet and regimen and various other circumstances, produce so powerful an influence either in retarding or accelerating the development of the whole, or certain parts of the organism, that the same physiological condition of individual organs, or of the entire system, will occur in one individual several weeks, months, or even years, sooner or later than in another. (Condie).

PATHOLOGY OF DEVELOPMENT.

It is the gastro-intestinal mucous membrane that is the chief seat of disease in infancy. A slight excess of food, or that which is too stimulating, or food unadapted to the condition of the digestive organs at this period of life; a trifling reduction of the temperature of the skin, personal impurities, or any degree of impurity in the atmosphere, will in general, give rise to colic, vomiting and purging, aphææ, tympanitic distensions of the abdomen, and the other phenomena of irritation and of acute or chronic inflammation of the stomach and bowels. Softening and perforation of the stomach, constituting the disease to which the denomination of Gastro-malacia has been applied by the German writers, most frequently occurs during infancy.

The inflammation, in many instances, extends from the alimentary canal to the mesenteric glands, producing enlargement and disorganization, attended often with enormous distension of the abdomen, and

extreme emaciation of the body, either in consequence of the defective digestion of the food, or the impediment to the free passage of the chyle through the diseased glands.

Inflammation frequently extends, also, from the digestive mucous membrane to the peritoneum. It here often assumes a very chronic form, and, sooner or later causes an effusion of serum into the cavity of the abdomen. Intestinal invagination is of frequent occurrence during the earlier stages of infancy. In many cases, its existence is not indicated by any other symptoms than habitual costiveness. It often, however, gives rise to acute pain, considerable distension of the abdomen, excessive vomiting, and death ; and is always to be ranked among the most dangerous affections to which the infant is liable.

Most of the acute diseases of infants and children are attended with more or less febrile action, that usually assumes the remittent type, with exacerbations toward evening, or during the night. Gastro-intestinal irritation or inflammation, which, being one of the most common of the affections of early life, is that which most usually give rise to the remittent fever, described as a disease peculiar to children, and attributed by many to malaria or to the presence of worms.

During infancy, morbid action exhibits a greater tendency to spread over the tissues in which it occurs, than in the adult. This is especially the case in inflammations of the mucous membrane ; these, unless quickly arrested by appropriate remedies, almost invariably extend themselves to a greater extent, along the course of the membrane ; increasing thus the extent of the disease, and at the same time diminishing the chances of its favorable termination.

Too much, or deficient and improper food, are among the most common of the causes of disease, from birth until puberty. By the disorder of the digestive functions induced by errors in diet, the blood becomes vitiated, or imperfectly elaborated, and the nutrition of every part of the body deranged or defective ; while at the same time, irritation of the alimentary tract is produced, running on to inflammation and rapid disorganization, or irritation becomes, sooner or later, transmitted to the brain, or reflected upon other organs, disturbing their functions, or producing serious disease of their substance.

In infants, disease is often produced by the impure or innutritive state of the mother's milk, even in cases when no such deterioration of the milk is suspected, the health of the female being apparently unimpaired. A very interesting paper on this subject, by M. Girard, has appeared in the *Archives Generales de Medicine*, in which is pointed

out the importance of testing the character of the milk by a microscopic examination in all cases in which the infant when nourished solely by the breast, becomes affected with symptoms of indigestion.

Every physiologist is aware of the change produced in the properties of the mother's milk, by the nature as well as by the quantity of the food, habitually taken. Too much, or too little food; a too stimulating diet; the use of vinous or distilled liquors, more especially if taken in excess, and articles of food difficult of digestion, cannot fail to effect the secretion of milk, and render the latter unfitted for the nutriment of the infant who partakes of it; milk thus deteriorated will very generally produce irritation of the infant's stomach, and all the symptoms of indigestion.

If an infant, in consequence of the inability of the mother to suckle it, is nursed at the breast of a woman, whose own child is several months older than it, indigestion will very generally ensue, in consequence of the milk containing an amount of casein, to the digestion of which, the stomach of the younger child is inadequate; the proportion of casein in the milk of the woman always augmenting with the age of the infant. (Condie).

ANATOMY OF THE ALIMENTARY MUCOUS MEMBRANE.

The mucous membranes are deserving of every attention that can be bestowed upon them, not only on account of the large surface they cover, but also in consequence of their physiological and pathological importance. As the cutis forms the external integument of the body, so does the mucous membrane form the internal covering of any and all the organs. (Jacobi).

The alimentary canal is divided into different compartments or cavities, which communicate with each other by narrow orifices. The cavity of the mouth is guarded at its posterior extremity by the muscular valve of the isthmus of the fauces. Through the pharynx and oesophagus it communicates with the second compartment or the stomach, a flask-shaped dilatation guarded at its cardiac and pyloric orifices by circular bands of muscular fibres. Then follows the small intestine, different parts of which, owing to the varying structure of mucous membrane, have received the different names of duodenum, jejunum, ileum. In the duodenum are situated the orifices of the biliary and pancreatic ducts. Finally comes the large intestine separated from the other by the ileo-cecal valve, and terminating, at its lower extremity by the anus, at which is situated a double sphincter, for the purpose of guarding its orifice. Everywhere the alimentary canal is composed of mucous membrane and a muscular coat, with a layer of submucous connective tissue between the two. The muscular coat is composed of a double layer of longitudinal and transverse fibres, by the alternate contraction and relaxation of which the food is carried through the canal from above downwards, and the arrangement of which varies in different portions of the alimentary canal. In early life the circular fibres are best developed. The mucous membrane presents, also, a different, and has different properties in different parts. (Dalton).

At all the external orifices the skin passes over into mucous membrane, each layer of the skin may be traced in a corresponding layer of the mucous membrane. Each layer also retains its significance in general; the epithelium remains here as upon the outer skin, a pro-

tective covering, which shuts off the organism from without; the mucosa represents the proper connective tissue body of the mucous membrane; the submucosa is a loose cellular tissue, which accommodates the moving about of the mucosa upon the muscular coat. But within this general definition the structure and function of each individual layer alters correspondingly to the physiological office of the various subdivisions of the tract of the mucous membrane.

The Epithelium.—Everywhere at the gateways of the mucous membrane system, the horny layer of the epidermis is thrown off, so that its ante-chambers, the oval cavity, the pharynx and œsophagus, the conjunctiva, vulva, preputial sac, the bladder and urethra, are only lined with the mucous layer of the epidermis, the so-called pavement epithelium. The pavement epithelium consists of a simple layer of small cylindrical cells, and a more or less thick stratum of large pavement cells, which flatten towards the exterior and are then cast off. No doubt can exist as to the significance of this decrease of thickness of the epithelium in the ante-rooms of the vegetative tract. It is the first step towards facilitating the osmotic change between fluids and gases in this tract upon the one side and the blood upon the other. Where this exchange, as resorption or secretion becomes more active, where it forms the foundation of entire nutrition the last layer of pavement epithelium disappears and the cylindrical cells alone remain. Thus the intestinal canal from the cardia to the anus, has a cylindrical epithelium. Its cells are larger than the cylindrical cells of the rete malpighii; they have been subjected to various modifications of external form, as the functions of the respective mucous membrane requires; but they, like those, are seated immediately upon the connective tissue and between their bases, here and there, only single reserve cells are visible for replacing their loss which are probably also not wanting in the rete malpighii. We see in this modification of form and size no obstacle to regarding them as anatomical equivalents of the cylindrical cells of the rete.

The body of the mucous membrane proper adjusts itself in the same manner as the epithelium to the peculiar functions of the individual subdivisions of the tract. Where it serves for the conveyance of contents as the œsophagus, we find a plain stratum of compact connective tissue fibrils, which limits itself smoothly and evenly towards the epithelium; passes over continuously, however, upon the other side into the bundles of loose submucous connective tissue. It is otherwise where the tract absorbs and secretes. For absorption, the most

extended surface of contact of mucous membrane with the chyme is of importance; accordingly we see the intestine, from the jejunum downward, is beset with the well known intestinal villi, of which each contains at its centre the beginning of a lymphatic vessel; and still more to facilitate transit, the connective tissue coat, which is inserted between the vessels and epithelium, shows here the peculiarities of lymphadenoid connective tissue, that formation which we first learned to know in the stroma of the lymph glands. To the apparatus of absorption belong the follicular glands, the solitary follicles, the plates of Peyer, the tonsils and follicular glands at the base of the tongue. These in a measure, present the first station, which matters arriving at the lymph tracts for absorption have to pass.

If these matters are irritant, hyperæmia, inflammation and new formations, mark their course; hence, in so many affections of the whole tract we can establish a predominant implication of the follicular glands. Only the smaller tubular of the secerning glands are in the mucous membrane, while the larger, especially the acinous mucous glands lie with their bodies in the submucosa. The abundance of glands in certain mucous membranes is so enormous that, for example, the mucosa of the stomach is five-sixths of its volume formed of glandular substance: (Rindfleisch).

The submucous layer consists of dense connective tissue, intermixed with bloodvessels and elastic fibres, in its deeper laminæ with muscular fibres also, and is covered with several layers of epithelial scales, which are readily thrown off and renewed, they may, however, be accumulated in yellowish, brownish, or black masses. Besides the bloodvessels there are lymphatic vessels, and the smallest ramifications of nerves, which are particularly found in the papillary prominences. They are either the last ends of a cerebral or spinal, or of the sympathetic nerves; the peculiar actions of these several nerves determining the functions of the locality in which they spread. The mucous membrane, influenced by the cerebro-spinal is more sensitive, as a general rule, than such in which the power of the sympathetic prevails. Thus, pain depends on the seat of the affection just as well as on its acuteness; the degrees of temperature are discerned by the pharynx, but not by the stomach or intestine; the urine produces no pain on the mucous membrane of the urinary bladder and urethra, but very much so on the conjunctiva; and often irritations meeting a mucous membrane effect no pain nor other local disturbances, but sympathetic sensations, like coughing or sneezing.

PHYSIOLOGY OF THE DIGESTIVE SYSTEM.

In its passage from above downwards, the food meets with at least five different secreted fluids, in greater or lesser proportions, namely: The saliva, and mucus of the mouth, the gastric juice, the intestinal juice, with the pancreatic juice and the bile. These fluids are themselves, in some instances, of complex nature, resulting from the secretions of several different associated glands, or of various parts of a single mucous membrane. As the result of the successive action of the digestive fluids, modified, perhaps, by the effects of their combined action, the substances composing the alimentary mass are gradually reduced to a fluid condition, in which they are fit for absorption. The action which is exerted upon the food by the digestive fluids is not that of a simple chemical solution. It is a transformation, by which the ingredients of the food are altered in character at the same time that they undergo the process of liquefaction. The active agent in producing this change is, in every instance, an albuminoid, or a nitrogenous matter, which forms the most important ingredient in the digestive fluid; and which in coming in contact with the food exerts upon it a peculiar action, transforming its ingredients into new substances. It is the newly formed materials which are finally absorbed by the vessels, and mixed with the general current of circulation.

The functions of the mucous membrane are both various and important. It takes a prominent part in assimilation and sanguification, and therefore suffers in all general, and all those local diseases, that in any way influence the general condition of the organism. They are frequently first affected, in a large number of diseases, many of which are primary; for the immense extension of mucous membrane, increased by indentations, villi, glands, and glandular ducts, and papillæ, is such that morbid processes may easily take place in one part or another. The influence of the diseased mucous membrane is, moreover, as great as its affections are frequent; the vital importance of the membrane itself, the legions of nerve ramifications in its tissue, and the contiguity and the rapidly developed consecutive affections of the mucous membrane contributing to the serious result. The

occurrence of oedema of the glottis in catarrh of the pharynx or larynx, or of collateral oedema of the vocal cords in diphtheritic inflammation of the larynx, are distinct and dreaded proofs of this fact.

In its normal condition, the mucous membrane exhibits a peculiar, tough, whitish or clear, more or less transparent, alkaline secretion. This mucus is composed mostly of epithelial scales, more or less transformed, of every variety; pavement, cylindrical, and vibrating, the latter without cilia; further, round, granulated cells, with one or more nuclei; and a clear, transparent, liquid. Epithelium, mucus and pus, are found combined in many instances of secretion on the mucous membrane, the various forms being, in this locality, but three different stages of the transforming epithelium. Under favorable circumstances, the mucous membrane forms puriform elements anywhere, but there is some difference in the process. The purulent mucus of the intestines seldom contains puriform elements, that is, pus cells, except in cases of genuine ulceration; the same result is found on examination of the purulent mucus of the uterus and tubes. But no ulceration is required in the mucous membrane of the bladder or urethra, to count immense numbers of pus cells in the puriform secretion of chronic vesicular catarrh and gonorrhœa. This difference depends on anatomical reasons. The intestines, uterus, and fallopian tubes have cylindrical epithelium only, the bladder and urethra have pavement epithelium. The mucous membrane will develop the more pus cells, without the presence of real ulceration, in proportion to the amount of pavement epithelium by which it is covered. Purulent though the secretion of other parts of the mucous membrane will look, it contains frequently nothing but cylindrical epithelium. The angular shape of the pavement epithelium enables it to form a cohering covering, which is not thrown off as the round pus or mucous cells; which result being obtained, the whole mass is thrown off by either the pressure of the subjacent new layers, or the influence of a thin and less cohesive transudation from the blood vessels, which, in its turn, forms another important element of the secretion. Whether it has a more important part than to be one of its elements; whether, for instance, from its substance cells may be developed, or whether the cells are under all circumstances but the later stages in the development of epithelial scales, is still an open question. This is certain, that what is called mucus is by no means the same liquid always, no more so than the secretion of the external skin is alike on every locality of its surface. Its reaction, as we

would expect, is acid in the stomach, alkaline in the mouth, and intestinal canal ; a mucus substance is secreted from the parenchymatous substance of some organs, without the presence of cells. There are pathological liquids, as colloid, very similar to mucus. There is the substance called after the name of Wharton, in the umbilical cord of the foetus and newly born, the cellular development of which cannot be traced ; and nevertheless this "gelatinous connective tissue" is transformed into mucus. Thus, from an anatomical point of view, the secretion of the mucous membrane is not a uniform substance; neither is it uniform as to chemical composition. It frequently contains albumen, some little fatty substance, extractive matters, and some mineral elements, as chlorides of alkalies, and phosphates of earths. These mineral elements belong to the mucine, which is a nitrogenous albuminous substance, swelling in water, but not dissolved by it, and to which the mucus owes its tough nature. Its chemical reaction differs according to its percentage of minerals, combination with poisonous substances, or its own peculiar modifications. This difference is easily explained by the fact that it is not performed in the blood and thrown on the surface, but is a production of the mucous membrane itself. Thus, its constitution depends on the amount of follicles, epithelial scales, papillæ, and on the character of the epithelium ; no matter whether it is formed strictly from the epithelium undergoing its final changes, or from transudation through the walls of the capillary vessels. (Jacobi.)

ALKALINE VS. ACID CHILDREN.*

When called to treat a child, one of the most important questions I settle, is whether I have an alkaline or an acid subject to manage. Such a division of children cases may seem singular, and possibly visionary, but let us glance at the natural history of the body and the changes it undergoes—the result of the working of human nature's laboratory. It seems that in a healthy child, first, the alkaline digestive elements are in preponderance, then slowly the acids obtain sway so that when the child reaches manhood these elements hold the ascendancy. In a normally healthy person these steps should be retraced, and we have an alkaline aged body.

Let us see if this is not true, at least, of the infantile part of life. If we go on a voyage of discovery down the alimentary tract of an

*From an article read before the Illinois Homœopathic Medical Association, by the author, in 1873.

infant, the first stream we meet of any size and activity, is the biliary; the salivary glands and pancreas, the stomach and intestinal glands are not yet called into activity to any great extent. The chief glands are the secretory liver, and the assimilatory lymphatics.

The liver occupies more than a third of the abdominal cavity. The stomach will be found tilted up under the ribs on the left side, and the sack-like duodenum is quite as important as the stomach. The amount of work performed by the liver is enormous, as the bile has to emulsify a large amount of milk taken by the child to get it ready for absorption. This bile is an alkaline secretion, and it gives alkalinity to the whole system, and this alkalinity is, or should be, present for many years. Acids and cold are the infant destroyers. The bile is chiefly composed of the *Cholate* and *Taurate of Soda*, *Biliverdin*, *Cholestrine*, etc. When the soda is lessened artificially or accidentally, as in disease, we have then two irritating acids, *Glycocholic* and *Tau-rocholic* acids. *Cholestrine* is the debris of the nerve fat, and no doubt aids the emulsifying of the milk fat. The *Bileverdin* gives color to the bile. The infants food we know is normally alkaline in character: Butter (oil), casein, and sugar of milk, with *salts of Potassium, Soda and Lime*.

The next set of glands that come into activity are the salivary glands and pancreas. The juices of these both give an alkaline reaction. The base of the saliva is *Sulpho-Cyanide of Potassium*, but what gives the pancreatic juice its very strong alkaline reaction is not known as yet. Thus we see in the next stage of the child's life, the two added secretory glands give alkaline products, as if to insure its best health during that most trying of all periods, the teething period. It is found by Prof. Sonsino that a child cannot completely digest starch until over ten months of age.

The next epoch in the child's life is when it is enabled to take and digest meat. And now we find the liver relatively smaller, the stomach lies more horizontal, its transverse and longitudinal fibres are better developed, and the amount of *Hydrochloric acid* secreted increases as age advances. The intestinal juices become more and more acid. To correspond to this change the mother's milk becomes more salty. Finally we reach the period when the stomach is the chief digestive organ in the body. This is the natural order, but it may be easily changed or deranged at any point and serious results always follow.

We see that, chemically speaking, the healthy child is most alka-

line. Externally, it presents a plump, rosy appearance, feeds heartily, sleeps a major portion of the time, and wakes to crow and laugh. It is hearty, healthy and happy, and would grace the arms of any proud Madonna — a pleasing subject for an artist's pencil. It teeths easily and develops without a struggle. It has been my fortune to make an autopsy, at the Chicago Foundlings' Home, on some of these healthy and wealthy (in fat) children that have died suddenly from meningitis, overlying, or from a bottle of sour milk. The stomach is still small, the lesser intestines narrow, while the liver is large, and the large intestines are healthy and capacious, and every part is well cushioned with fat, stored up for the future, as well as present, great demands upon the system.

This natural order of developmental activity may be totally and permanently deranged. If not fed properly, the acid mucous secretion of the mouth may increase, and so reinforce the gastric secretion that the milk is curdled rapidly into solid masses, which the bile cannot emulsify. The excessive acidity exhausts the soda base, and liberates the bile acids, which swelling the acid contents, generates colic and distress everywhere. The milk may be neutral or acid, if the mother is spare, or, if it is cow's milk, so very acid as to develope acidity high up in the alimentary tract. In either case, digestion and development are arrested.

While the alkaline child, is a plump, healthy one, the acid child is quite a different subject; whether the acidity is induced by the first dose of sweetened water, or subsequently by negligence, thin milk, or dandling, the result is the same. It is thin, scrawny, cross, and sours all those who have to care for it, and ruins the reputation of all babydom. It nurses, or would nurse constantly, cries and squirms incessantly, vomits occasionally, and its bowels are always out of order. Its teeth are cut with difficulty, its intestinal irritation is interpreted as worm symptoms, and it is often the victim of vile drugging. It is a life-long invalid, and every one feels that it is a mercy when it is gone, whether this is in infancy, during teething, at puberty, or at maturity. The post-mortem appearances of an acid child are the opposite of those of the alkaline child. The stomach is large and usually distended with food the liver shrunken, the body is anaemic, while the absence of fat everywhere is noteworthy. The brain is especially anaemic and shrunken.

There is a *disease alkalinity*, as well as a disease acidity. The tendency may be to too much fat; the system may be clogged, giving a feeble bony and muscular development, thus rendering the child a prey to disease, but still of another class, with different symptoms.

GENERAL PATHOLOGY.

The great progress of pathological anatomy and differential diagnosis, ought not to be lost on us. The period when the diseases of small children consisted in dentition, of advanced ones, in worms and scrofula, of adults in rheumatism, scrofula, and syphilis, is past. With sound principles in pathology, and a correct knowledge of pathological anatomy and differential diagnosis, all the different and numerous affections of the mucous membrane: simple injection, with or without extravasation; acute hyperæmia, with increase and alterations of the secretions, and follicular swellings; acute bloody or serous exudations, with more or less severe symptoms; pseudo-membranous deposits of epidemic, syphilitic, or mercurial character; purulent discharges; ichorous decomposition; chronic alterations of both vascularization and secretion; haemorrhage; œdema; hypertrophy, and whatever changes take place in the mucous membrane of all organs, will no longer present the necessity of resorting to an obscure, generally erroneous and improbable, and almost always unproven, explanation. (Dentition and its Derangements.)

PATHOLOGY OF MUCOUS MEMBRANE.

In regard to the diseases of the mucous membranes, their tendency, however, is not uniform; individuality and age belonging to those influences which are most apt to modify the alterations taking place in their tissue or secretions. Affection of the mucous membrane are very rare in foetal life, because of the absence of both mechanical injuries and functional disorders. In infantile age the mucous membrane reaches its greatest importance, new influences acting upon it, and calling into life new functions, especially the normal state of injection, which is very considerable indeed. A very common alteration, taking place in the mucous membrane, is mollification; plastic exudation, haemorrhage, suppuration and ulceration, being very rare in the first year of life. After this time exudative processes are more numerous, especially fibrinous exudations are not unfrequent. This predisposition of early age to contract diseases of the mucous membrane, afterwards decreasing

not very common in advanced age, until in senile age it is rather increased.

A number of the diseases of the mucous membrane in early age are of a primary nature, and many of them result from direct local injuries. It is a singular fact, however, that thorough and deep local injuries, cuts, and wounds of any kind, of the mucous membrane, dangerous though they look, are attended with very little danger in the majority of cases; they will generally heal readily, and lose nothing of their merely local character. Thus, foreign bodies entering the substance, combustion destroying the structure of the mucous membrane, although sometimes among the causes of disease, will not so frequently give rise to a severe affection, as a less serious injury often repeated. Animal and vegetable parasites, and indigestible food, will therefore, as their influence extends over a long period, although their sudden assault is often but inconsiderable, be among the most frequent diseases of the mucous membrane of the digestive organs. Another very frequent and important cause of disease of the mucous membrane, is cold. We are entitled to state this as a fact, although we do not know whether cold acts by the suppression of cutaneous secretion alone, or by some influence on the peripheric cutaneous nerves and reflex action alone, or by both. It is, however, a fact that especially the mucous membrane of both the respiratory and digestive organs is very subject to the influence of cold, together with the other causes of disease, depending on the general condition of the atmosphere, and the changes and the general influence of season, of epidemics and endemics. (Jacobi.)

THE SECONDARY AFFECTIONS OF THE MUCOUS MEMBRANE.

These are the usual results of either local propagation in the continuity of tissue, or of symptomatic spreading. We know from general pathology that there is a direct connection between cutis and mucous membrane, scalp and nose, mammae and uterus, urethra and testicles, and stomach and brain; we need not be astonished then, that there is a contemporaneous affection, sometimes, of the mucous membrane of the nose and the lungs, the larynx and trachea being free from disease; or of the stomach and colon the small intestines being not at all affected. And the spreading of the affections of the mucous membrane on continuous tissue is so very general, that lobular pneumonia, for instance, is in all cases recognized as the termination of a catarrh of the bronchi; and a

protracted catarrh of the colon, with ulceration of the follicles is known to be an usual consequence of catarrh of the small intestines. Nor is the topical propagation of affections of the cutis over the adjoining mucous membrane an exception, but the rule. The transmission of diphtheritic and other processes of the external integuments of the lips, anus, and pudenda majora, or the rectum and vagina, are frequently observed.

Thus, it appears that nothing is more natural than a universal or wide-spreading hyperæmia, changes in quantity and quality of secretions, rupture of blood-vessels, and even neoplasms. The alterations observed in the secretions are frequently more important in relation to post-mortem epicrises, than anatomical change of the tissue itself; not unfrequently no anatomical trace is detected in patients who have died from, or with, hyperæmia of the brain, pharynx, intestines or cutis. The abnormal secretions are therefore as important elements, in regard to the results of post-mortem examinations, as they, again, are ready causes of renewed attacks, from the local irritation depending upon their presence on the membrane. The prognosis, therefore, depends greatly on their nature and amount, and frequently as much on them, as upon the structure of the membrane, its epithelium, follicles, or its papillæ. To a great extent they also influence the symptoms, amongst which, functional disorders and anomalous secretions are always prominent. Pain is sometimes observed, but is frequently indistinct and obscure. Of more importance than the latter, however, are some indirect symptoms, of which reflected motions, and even muscular paralysis are frequently met with. Thus, sneezing, coughing, vomiting, and tenesmus are brought on. Disorders in neighboring or distant parts are affected by the suppression of secretion and injection of the tissues; topical spreading on the subjacent submucous tissue, as in the œdema of the glottis, and retro-pharyngeal abscess; and participation of the whole system. (Jacobi.)

ETIOLOGY.

The conditions of the atmosphere and seasons are of great importance in the etiology of the affections of the mucous membrane in early life; for we know that not only malarious influences and animal effluvia will readily act on the impressible infantile organism, but that the constitutional and contagious poisons are mostly observed to produce their peculiar forms of disease in infantile age. Thus children are the majority of patients suffering from

eruptive fevers; scarlatina, measles and diphtheria, mostly attacking the infantile organisms. And here it is important to state, that a peculiar part of the mucous membrane has always a tendency to be affected by a peculiar constitutional poison, both in early and advanced age. Thus, diphtheria, scarlatina, syphilis and mercurialism show a predilection for the mucous membrane of the mouth and pharynx, typhus for the ileum, dysentery for the colon, measles and iodism for conjunctivæ and nose. All such affections, although common to every age, are mostly found in the infantile period, the modes of propagation and transmission being eminently distinct at this period of life.

GENERAL ANOMALIES OF THE MUCOUS MEMBRANES.

It will be profitatble for us to study the general pathological changes that the mucous membrane undergoes before the various forms of its diseases are examined in detail. We will follow Rindfleisch in his excellent histo-pathological analyses of the anomalies of the mucous membranes. (p. 333, *et seq.*)

CATARRHAL INFLAMMATION.

The greater part of all diseased conditions of man are catarrhs of the mucous membranes, or are complicated with it. The name catarrh emphasizes but one, certainly the most prominent phenomenon of the disease—hypersecretion of the mucous membrane. It must, however, be remembered that the hypersecretion never exists without hyperæmia of the mucous membrane, and that this hyperæmia is the proximate cause of the hypersecretion. At the same time, hyperæmia is the remote cause of other disturbances, e. g., tumefaction, haemorrhage, pigmentation, hypertrophy, etc., which taken together, make out the anatomico-pathological picture of catarrh of mucous membranes.

I. *Hyperæmia* is, consequently, to be regarded as the anatomical foundation of catarrh. The hyperæmia may be active or passive. In the first instance it is the immediate consequence of a pathological irritation; in the second, it for a longer time, precedes the catarrhal inflammation, and is the predisposing cause. Reference is here made to bronchial catarrhs of persons suffering from heart disease, of gastric and intestinal catarrhs, in difficulties of the portal circulation, in the liver, of haemorrhoidal, rectal and vesical catarrhs.

We will notice, that on account of the delicacy and penetrability of the epithelial stratum, the access of external irritants to the mucous membrane is far more easy than in the case of the outer skin. Here no elastic envelope (as is presented by the horny layer of the epidermis), opposes a barrier to the distension of the congested capillaries; but the softness of the parenchyma permits an almost unlimited dilatation. The relation to which the contrac-

tion of the intestinal muscular coat stands to the distribution of the blood, in the covering mucous membrane, is of peculiar interest. As is known, the trunks of the arteries and veins, which supply the blood to the vascular nets of the gastric and intestinal mucous membrane, pass through the muscular coat in an oblique direction. They are there surrounded by a sheath of loose connective tissue, which is tolerably strong in the arteries, so that there remains a wide space between the arteries and the muscular bundles; in the veins, on the contrary, very insignificant, so that the laminæ of the veins are easily compressed by a contraction of the muscular coat. In consequence of this arrangement, with every contraction of the intestinal muscular coat, an obstacle occurs to the return of the blood from the intestinal mucous membrane; there takes place an increased congestion of blood, which continues as long as the contraction lasts, and may assume a more permanent character by frequent repetition of the contractions, as in colic. The great significance of this for the digestive process is evident. The peristaltic contractions, apart from locomotion of the contents, also, by means of the hyperæmia of the mucous membrane, they excite and maintain, a favorable influence upon secretion and absorption; upon secretion, because they supply to the open mouthed glands a more abundant raw material; upon absorption, since they effect that squeezing out of the capillaries of the villi, which, according to Kolliker, plays so important a role in the filling up of the central lymph space. Every physiological hyperæmia is a Danaen* gift for the organ subjected to it; but the slightest disturbance of the mechanism turns the benefit into a calamity. Nowhere does this catarrhal disturbance of the circulation attain so high a grade as in the gastro-intestinal mucous membrane, because the pathological irritant awakes the peristaltic action as promptly and stronger, than the physiological irritation of the ingesta. Dysentery and cholera (*cholera infantum*), presents us with striking examples. The enormous œdema of the mucous membrane of the large intestines in the former, the haemorrhages, (secondarily) and diphteritic destructions, are also developed under the influence of severe tonic contraction of the muscular coat; and if we accept that in cholera an enormously increased peristalsis contributes its share to the immense transudation, we have thereby established

**Timeo Danaos et dona ferentes.*

only a casual connection between the known phenomena of this disease. What occurs on a large scale in dysentery and cholera, is repeated upon a lesser in the slightest catarrhs.

II. That the *swelling* of the catarrhal mucous membrane, the second anatomical element of this form of inflammation, is partly at least, derived from the hyperæmia, is self evident. It is, in so far as it depends upon the increase of the volume of the vessels, and upon a more abundant saturation of the mucous membrane with serum. The latter plays an important role in congestive catarrhs, and are characterized by the lardaceous gloss of the swollen membrane, as also the clear serum, which is poured out from an incision. The swelling is more when the submucosa participates in it. This is frequently the case, especially at the cæcum. The active intumescences, i. e., tumefactive conditions of the lymphatic follicles, depending upon cell formation, interest the pathological histologist more than these passive ones. It is probably without doubt connected with the intimate relations of these glands to the absorptive processes, that in almost every catarrh of the mucous membrane, there is a more or less extensive co-affection of the lymphatic apparatus, which takes up the lymph of the diseased mucous membrane. The follicles imbedded in the mucous membrane are the most frequently and rapidly diseased; the proper lymph glands lying without the tract follow secondarily, e. g., in the catarrhs of the nasal, faacial, and oral cavities, the lymph glands at the neck; in the respiratory tract, the glands about the roots of the lungs, and bifurcations of the trachea; in the digestive tract, the mesenteric glands; in the urino-genital apparatus, the retro-peritoneal and inguinal clusters of lymph glands.

Concerning the process itself, it is essentially that of acute lymphadenitis suppurativa. This presents itself most purely and simply in the *follicular suppuration of the gastric and intestinal mucous membrane*. The severe intestinal catarrhs of midsummer (summer complaints), occasionally manifest the collective stages of the process, while its beginnings are found as intercurrent or initial phenomena also in tuberculosis, in typhus, Asiatic cholera, and dysentery. As a rule, simultaneously with the commencing of swelling, one observes a denser, stronger injection of the blood-vessels in the surrounding of the follicles; and it appears as though the general hyperæmia had concentrated particularly about the follicles, partly however, this hyperæmia may be collateral, depending upon

the entrance of the blood being impeded in the follicle itself. The solitary follicle presents itself as a faintly grey bead, of the size of a pin's head, which is encompassed on all sides by a vascular circle. A Peyer's plate (patch) affords in this stage the most elegant picture, since the hyperæmic rings of the adjacent follicles touch one another. With the occurrence of suppuration, the follicle swells up to the size of a small pea; in its place one perceives a yellowish, fluctuating spot, above which the outer layer of the mucosa passes, moderately stretched. If we let out the pus, the cover collapses, and the place sinks in somewhat. The cavity may be again infiltrated by pouring water over it, and one has an opportunity of admiring its comparatively great extent. The latter is only explained by the participation of the surrounding connective tissue in the suppuration; namely, as long as the pus is contained in the parenchyma of the mucous membrane as an abscess, it acts, if you allow the comparison, catalytically all around on the connective tissue. Hence, at Peyer's patches it proceeds, not at all infrequently, to a subcutaneous communication between adjacent follicular abscesses, whereby the mucous membrane is undermined for great distances. Finally, the covering necrosis is loosened from the edges, and shows us a loss of substance, produced by the ulceration, in the form of a sharply defined round or roundish ulcer. As a rule cicatrization probably ensues without difficulty, though Rindfleisch once observed a perforation of the intestinal wall close above the ileo-cæcal valve.

The follicular swellings and ulcerations of the stomach presuppose the presence of follicles in the gastric mucous membrane, but as is known, there are stomachs in which we seek in vain for a single follicle. Probably, however, it is to be taken into consideration with the stomach, whether a formation of follicles may not take place *ad hoc*, in the manner that Henle imagines the production of "coglobate" glands in general. The formative irritation which the connective tissue of the entire mucous membrane experiences, concentrates itself in a certain measure, upon a number of foci, as an exanthem of the skin distributes itself upon a certain, although often very large, number of circumscribed depots; according to what law we know not. The circumstance is characteristic for the stomach, that all follicles are constantly found in the same stage of transformation, whether as grey beads, abscesses, or ulcers.

The analogous conditions of the tonsils present somewhat more

complicated relations. The half spherical surface of this organ, as is known, shows certain pocket-like depressions. The pavement epithelium of the oral cavity lines the depressions; not infrequently we find, especially at the neck of the pockets, small papillæ, which resemble the papillæ of the tongue in miniature. Round about the pockets lie the lymphatic follicles, in the parenchyma of the mucous membrane. They are separated from the surface by a thin layer of connective tissue, and do not touch it. If, now, we have a catarrh of the pharynx, with angina tonsillaris, an increased shedding off of epithelium takes place, not only upon the tongue, but also at the surface of these involutions. In consequence of which a large amount of pavement epithelium accumulates in the pockets; a white, smearable mass, like the vernix caseosa, forms an extensive plug, which indeed projects from the outlets of the pockets, but is not thrown out, so that already this filling contributes not inconsiderably to the enlargement of the whole tonsil. To this the inflammation and formation of abscess of the follicle associates itself. One after the other (as it appears all do not simultaneously enter into the process), tumefies and softens. The adjacent abscesses here and there flow together; finally, that is to say, when the maturation of the condition is not disturbed by premature medical interference, the entire tonsil is penetrated by a sinous abscess, (quinsy), which becomes a sinous ulcer, if the pus has emptied itself at the surface. As a rule, this occurs simultaneously at several points. The gland thereafter suddenly collapses, provided that a complete confluence of all the purulent follicles have taken place. If this is not the case, the follicles yet unopened, as well as those which in general have been spared, remain in their present condition, and exhibit what yet remains of the tonsil. The filling up of the ulcerated cavities with cicatrized tissue, as a rule, proceeds rapidly, and without dangerous complications. If the healing is retarded, should even the floor of the ulcer take on a gangrenous, putrefactive character, the neighborhood of the internal carotid becomes a source of danger, because it may lead to uncontrollable haemorrhage, if the vessel is isolated by the suppuration, and then corroded at the side. [Haemorrhagia per diabrosin. From ulceration.]

ANOMALIES OF CATARRHAL SECRETION.

The changes which the *secretion* of the mucous membrane experiences by catarrhal inflammation, are so striking, and present

points of support so important for clinical decision, that it has been here and there believed that we could define catarrhs immediately as anomalies of secretion. This is not correct, for the anomaly of secretion is not the essence, but the consequence of the catarrhal inflammatory condition. But it would be erroneous, did we see in catarrh only an increase of the normal secretion. There is a difference between secretion and excretion, and this difference prevails here. Physiologically, the most important secretion of the mucous membrane tract, the gastric and intestinal juices, are by no means secreted in greater quantity from the catarrhal than from the healthy mucous membrane; on the contrary, a decrease is to be expected as a functional disturbance accompanying catarrhal inflammation. It is different with the physiologically less important mucus, which covers the normal mucous membrane. We know "mucous" catarrhs, in which mucus is furnished in increased amount. They occur, par excellence, at such places of the tract as are distinguished for their greater abundance of mucus-preparing glands, as the pharynx, the respiratory passages, the stomach and large intestines. Yet we know that the preparation of mucus does not belong exclusively to the acinous glands, but that the mucous metamorphosis is the same for the protoplasm of the epithelium of the mucous membrane, that the horny metamorphoses is for the cells of the epidermis, and hence, we do not wonder at finding mucous catarrhs and mucous admixtures in catarrhal secretions, and that from mucous membranes without glands, for example, at the urinary bladder.

A somewhat more intense irritation than the simple mucous catarrh presupposes the increased secretion of "cellular" elements. We distinguish, in this connection, epithelial and purulent catarrhs, according as the secreted cells are predominantly epithelial cells, or pus corpuscles. Predominantly, because as a rule, we find both together. A purely epithelial catarrh is, for example, observed upon the mucous membrane of the tongue, where the so-called coating of the tongue is nothing less than a massive separation of pavement epithelium, such as is characteristic at this point of the mucous membrane tract. We have no ground whatever to assume that the epithelial cells produced in excess, are formed according to any other than the normal principle of development, and in this connection we may conceive the epithelial catarrh as a simple hyperplastic process. But what if we find pus corpuscles in the

catarrhal secretion? Have we to do with a purulent catarrh? It is a question whether the catarrhal pus corpuscles are also to be regarded as emanating from the sub-epithelial connective tissue. Against this formerly universally received opinion, the circumstances especially testify that we can demonstrate an epithelium, either by scraping the surface or by vertical section upon mucous membranes which were completely in the condition of purulent catarrh, and that this epithelium presents not any or but unimportant deviations from normal relations. In fact, later investigations in which we have participated, after Remak and Buhl, have taught that the pus of mucous membranes can arise by endogenous formation in the superficial epithelial cells themselves.

Mucus and cells are productions of the mucous membrane, they represent the supplied nutritive material in increased amount, after it has been subjected to certain alterations into secondary products. The relations are different in many catarrhs of the gastric and intestinal mucous membrane. The ordinary diarrhoeic stool depends upon a "serous" transudation in the region of the small intestine. The blood serum, with albumen and salts, passes from the vessels of the villi directly to the surface, and is carried down the intestine by strong peristaltic movements, so rapidly that absorption in the large intestines cannot keep pace with it.

The cholera catarrh distinguishes itself from ordinary diarrhoea, on the other hand, by the exclusion of albumen from the transudation; *the choleraic transudation consists entirely of common salt and water.* (Schmidt.) Upon the other, by the participation of the whole tract, from the cardia to the anus; finally, by the enormous quantity and the rapidity with which the transudation ensues. The rapidity is so great that the epithelium of the small intestine, especially, together with the epithelial lining of the glands of Lieberkuhn, is lifted off and washed away in larger and smaller shreds. (Meal soup or rice-water stools). If we observe these shreds from the one side, we see long, glove-finger-like epithelial covering of the intestinal villi; if we observe the other side, we are aware of the more globular and short linings of the crypts of Lieberkuhn. The intestinal mucous membrane is therefore in a, so to say, "flayed" condition, and is relentlessly exposed to the hostile actions of the intestinal contents, a circumstance which must not be forgotten in explaining the superficial gangrenous sloughs which the intestine is wont to present in the second stage of cholera.

HÆMORRHAGIC CATARRH.

The "hæmorrhagic" catarrh distinguishes itself from the "serous" exudations by this, that it does not appear upon the surface of the mucous membrane in its individual constituents, but as blood. The exit from the vessels regularly ensues at the most prominent points; at the stomach, upon the connective tissue ridges, which surround the outlet of the glands in the small intestines, at the apices of the villi, and indeed, by preference, from the apices of those villi which beset the edges of the valvulae conniventes, in the ileum and colon, the surroundings of the follicular glands are preferred, in the colon, especially the plicæ sigmoidæ. The process itself is a so-called diapedesis. The blood passes in the smallest portions from the correspondingly small vents at the curves of the vascular loops, first of all into the connective tissue parenchyma, and from there to the surface. If afterwards the hæmorrhage ceases, a portion of the poured out blood-corpuscles remains in the parenchyma, and gives occasion for the formation of a brown, to a black pigment. Accordingly, the mucous membrane appears, in toto, brown, yellow, grey, or even black, whereby the dissemination of the pigment follows the laws just discussed, and is only in rare cases, of high grade, a more uniform one; so that, the stomach looks as though ink had been poured over it.

A peculiar series of phenomena are developed by the possibility that serous transudations may also occur upon mucous membranes with stratified pavement epithelium. The outer well-articulated cell stratum then for a time resists the passage of serum, is raised from its position, and this gives rise to a vesicular eruption. Accordingly, we see in catarrhs of the oral cavity, the mucous membrane of the lips, the gums, the tongue, and the cheeks, not unfrequently beset with watery, clear vesicles, up to the size of a pea, but mostly miliary, which burst after twenty-four hours, and empty their contents. The affair is either concluded herewith, or subsequently the elevated portion of the epithelium is entirely cast off, and there is left behind a small round deficiency of the epithelial stratum or excoriation. The exposed mucous membrane then, for the time being, produces pus, the contiguous *edges of the epithelium* are macerated, and appear to the unaided eye like sharp white contours; the whole is surrounded by a hyperæmic area, and this condition of a circumscribed purulent catarrh lasts as long as the catarrh in general continues. The so-called "ulcers" may enlarge, so that finally the greater part of the oral cavity is sore, the lesser part normal. (*Stomatitis scorbutis*).

CHRONIC CATARRH AND HYPERPLASTIC CONDITION OF THE MUCOUS MEMBRANES.

What has hitherto been stated concerning catarrhal inflammation characterizes one course of the process, acute catarrh. After this the mucous membrane may return completely to the normal state. The behavior of the connective tissue parenchyma of the mucous membrane is herein most important. We have just seen, in speaking of the changes in the secretion of mucous membrane, how actively the sub-epithelial connective tissue participates in the catarrhal inflammation. Not in the slightest degree is the thickening and puffing up of the catarrhal mucous membrane to be laid to cellular infiltration of the sub-epithelial connective tissue. All these cells must completely vanish ere the restitution can be called complete. They partly undergo fatty degeneration, partly they may be taken up into the lymph-vessels. Until this, however, has occurred, weeks may pass by, and so long as the mucous membrane, a locus minoris resistentiae to new irritants; for the greater the number of irritable elements, so much the greater the irritability of the whole organ. This point of view is not always properly valued by physicians and patients. The latter are similar in situation to those whose mucous membranes are predisposed by a static hyperæmia to catarrhal inflammation. The danger is, that the catarrh will return upon the slightest occasion to just the place where it seemed to have left. The relapse then is wont to be more stubborn than the primary disease. The vulnerability of the mucous membrane, and with it the danger of a new relapse, is constantly increased thereby, and always lasts longer. Each relapse increases the number of cells in the connective tissue of the mucosa; the epithelium and the glandular apparatus also gradually participate in the persistent enlargement, the mucous membrane passes over into the condition of hypertrophy. The hypertrophy; therefore, viewed from this side, is a production of catarrh; upon the other hand, it may be regarded as an anatomical predisposition to catarrh, since the phenomena constituting catarrh, hyperæmia, swelling, hypersecretion, are already developed up to a certain pitch, and become stationary, so that it requires but a slight excitement to increase this to a catarrhal inflammation. (Chronic Catarrh.)

HYPERTROPHY OF THE MUCOUS MEMBRANE.

Let us now consider the anatomical peculiarity of the *hypertrophy of the mucous membrane*. *a.* The hyperplasia of the connective tissue becomes particularly striking where, under normal circumstances, it

only appears in sparse amount as the cement of the densely crowded tubular glands upon the mucous membrane of the stomach. The small partitions between the outlet of the glands, as the most superficial layer of this cement, becomes here the place of exhibition of often a very luxuriant production of young connective tissue; they are elevated in the form of villi lamellæ, up to one line above the level of the mucous membrane, and may then be recognized by the naked eye. In other respects, the connective tissue hyperplasia is very much in the background beside the hyperplasia of the glands, as well in its microscopic as in its macroscopic effects; one even forgets that the connective tissue which surrounds the enlarged glands, which forms the pedicle of a polyp, etc., is in good part only newly formed.

b. The epithelium covers the hypertrophic mucous membrane just as completely as the normal, hence we may assume a growth of this in surface, which is proportional to the enlargement of surface of the mucous membrane itself. Moreover, it appears to be firmly attached to the connective tissue, without its continuity being in the least interrupted, or even a single cylindrical cell wanting, for example, at the respiratory mucous membrane it not only allows considerable amount of transudative fluids to pass through it from the deep parts to the surface, but also a large amount of young cells, which mingle with the secretion as mucus and pus corpuscles.

c. The increase of volume of the open-mouthed glands is, as a rule, regarded as a functional hypertrophy. As the muscle, by exercising its power increases its volume, so here the glands are said to enlarge by the abundant secretion. In opposition to this view, we place a greater value upon the retention of the secretion and the passive dilatation of the gland by it. In the hyperplasia of the subepithelial connective tissue, we have a mechanical obstacle to the outflow of the secretion. By it, the excretory duct is narrowed and occluded, while the body of the gland, especially if it lies in the submucous connective tissue, can enlarge unimpeded. Meanwhile, we are very far from declaring glandular hypertrophy purely as a glandular hyperactivity. In most hypertrophic glands we can distinctly observe an elongation or increased convolution of the tubuli, an increase of the acini, as also a luxuriant cell proliferation in and about the glands. But we must not overlook the constant phenomenon that the tubuli and acini and the hypertrophic glands are wider, and contain more accumulated secretion than they should, and we seek the irritant for the new formation in the pressure for the secretion acting from within outwardly,

which cannot be properly evacuated, because of the contraction of the secretory duct.

Cystic Degeneration.—We learn that under proper circumstances, even the hyperactivity attains the predominance over the hypertrophy, and then we meet the *cystoid degeneration* of glands upon chronic catarrhal mucous membranes. Both conditions complicate each other in the most manifold manner, and thereby give occasion to a series of coarser deformities of the mucous surface, which we will shortly discuss.

CORRUGATED MUCOUS MEMBRANE.

The so-called *etat mamellonne* (nipple appearance) of the gastric mucous membrane, is produced by being hypertropic in its glandular layer, no longer finds space upon its substratum, and is thrown into hills and valleys. Up to a certain degree this corrugation, especially in the pyloric region, is physiological; hence the *etat mamellonne* in the first place appears as only a quantitative excess. The determination of the boundary is only possible by microscopic analysis. The striking dilatation of the hypertrophic glandular tubuli gives a sure criterion for the pathological character of the condition. Higher degrees of the *etat mamellonne* lead directly to polyposis ventriculi. We commonly find all transitions together upon the same gastric mucous membrane. By a crossing of the folds, which is most distinct especially at some distance from the pylorus, towards the centre of the stomach, smaller folds are produced, upon which the hyperplasia of the glandular layer attains even higher grade. A flat roundish tubercle rises from the surface. The higher this becomes, by the disproportional increase of volume of the projecting part does it become a fungous, finally a polypi, with a globular head, somewhat above the size of a pea, and quite a thin pedicle. Such polypi, which contrast very strikingly with the remaining gastric mucous membrane by their dark red color, we find occasionally to the number of thirty; often four to six are attached in common to a broad base. Next to carcinoma, it is the most considerable, and at the same time, the strangest deformity of the gastric mucous membrane we have. In the interior of the head of the polyp we find, beside the glandular tubuli, actual cysts here and there, which are filled with fluid as clear as water, with mucus. The connective tissue between the tubuli, with the epithelial-bearing walls of the latter, present a system of septa, which, beside the degenerated tubuli, occupy perhaps as much room as the septa of an inflated lung besides the lamina of the alveola. Apart from this,

it is distinguished, at least in the cases examined by us, by the great number of peculiar, oval, strong, shining and almost reactionless bodies, whose histological significance has for the time remained doubtful.

To the etat mamellonne of the stomach, upon the one hand, the gelatinous or cystoid degeneration of the mucous membrane is associated, upon the other, to the formation of the mucus polypi. The gelatinous degeneration which, up to the present time, has only been found on the intestinal mucous membrane, is produced, in that, at a circumscribed place, up to the size of a silver dollar, according to an observation of Virchow, the glands of Lieberkuhn fill up with mucus and become cysts of retention of the size of a millet-seed. Contiguous cysts, by atrophy of their partitions, fuse together, whereby larger cavities arise; finally, the mucus in the entire structure predominates to such an extent, that the affected part of the mucous membrane attains a gelatinous consistency and color. Upon mucous membrane where the open mouthed glands are not so dense, (especially at the neck and external orifice of the uterus,) the analogous condition does not develop into the gelatinous degeneration; the glands filled with mucus have a tendency to project individually above the level of the mucous membrane and to form vesicular elevations, probably also purulent vesicles, (so-called ovula Nabothi,) which taken together with the hypertrophic and largely secreting mucosa, permeated by dilated vascular trunks, present the anatomical picture of chronic catarrh, (chronic metritis.)

By *mucoid polypi* we understand gelatinously soft, reddish tumors, permeated by delicate vascular ramifications, and attached to the surface of the mucous membrane by a more or less distinct pedicle. The external form is either smooth and roundish, or lobulated, and divided by fissures. Upon section, we observe milk-white, fibrous lines, which radiate from the periphery of the polyp to the point of insertion, as also larger mucoid cysts, which before being opened feel elastic and hard. Microscopic examination demonstrates a continuous epithelial layer, consisting of cylindrical cells, which represent the outermost layer of the polyp. The mass of the tumor is formed by hypertrophic glands; we see tubes whose walls exhibit numerous shallow and deep involutions, whose end, however, is beset with fully formed glandular vesicles. A perfectly cylindrical epithelium lines the tube within, and concentrically stratified mucous masses fill the lumen. Beside the mucous glands, a certain quantity of soft connec-

tive tissue, rich in cells, which fibrously condenses only in the pedicle, and radiating threads proceeding thence. The pedicle principally contains the afferent and efferent blood vessels. Nerves as yet have not been demonstrated in it. It is manifest that the mucoid polypi owe their production to a circumscribed hypertrophy of the mucous membrane, then that of the uterus. Rarer points of departure are the small and large intestines, the larynx and the trachea, the female urethra, the external auditory passage, as also the cavities of the superior maxillary bone and the frontal sinuses.

The *closed glands* of mucous membranes assume a position in reference to chronic catarrhs and the chronicity of the catarrh, exceedingly worthy of notice. The genuine *hypertrophy of the tonsils* only, which occurs after repeated acute fluxions of the pharyngeal mucous membrane, is quite analogous to the simple hypertrophic processes which we have just considered. This depends upon a process of growth uniformly affecting all the histological constituents of the follicles, the reticulum, the vessels, the lymph passages and the cells. The single follicle attains three to five times its normal volume. The form and size of the entire tonsil changes in accordance with this. It forms a globular, often directly a pediculated tumor, which can reach forward so far into the pharynx that the respiratory process is interfered therewith. The surface is smooth, except the depressions which correspond to the orifices of those small crypts about which the follicles are grouped. These orifices, otherwise roundish and open, are here distorted and closed by the swelling.

Analogous conditions of the remaining follicular glands of the intestine are not known. Instead, we find in certain individuals peculiarly disposed thereto, the important phenomenon, that in consequence of inflammatory organic affections in general, especially in consequence of catarrhal affections of mucous membranes, the nearest lymphatic glands experience an enlargement. This distinguishes itself from the formerly considered acute swellings, by the gradual growth and persistency, and from genuine hypertrophy by the disproportional increase of cellular constituents, and the disorganization of the glands conditioned thereby; from both, however, by the enormous volume which the gland may attain. We mean the scrofulous or caseous degeneration, which, when it affects the mesenteric glands alone, produces the array of symptoms called *tabes mesenterica*. This, of course also occurs at the solitary and Peyerian follicles of the intestine, yet they are so intimately connected with the tuberculous degeneration of the mucous membrane, and are so regularly combined with it, that it would be unwise to separate them. (Rindfleisch. Pathological Histology.)

DISEASES AND MALFORMATIONS OF THE MOUTH.**DEVELOPMENT OF THE ORAL CAVITY.**

The oral cavity is at first common to the mouth and nose. Then a lamella is given off from the superior maxillary tuberosity, on either side, which is directed horizontally inwards. These two palatine lamellæ meet at the median line in front, about the eighth week, and by the ninth week the union should be complete. The superior maxillary bones proper, and the soft parts covering them, unite at an early period with the incisive bone and the median portion of the lower lip.

The division of the alimentary canal proposed by Meckel, consists of the cephalic, thoracic, and abdominal or subdiaphragmatic portions. The mouth and its appendages comprehend the cephalic portion. In the first place, let us consider the form and aspect which they present in a state of health, both during intra-uterine life, as well as after birth.

The oral cavity is very small the first period of foetal existence; it is not until about two months that it deserves the name of a cavity, and it is then almost entirely filled with the tongue; and the motions of the lower jaw are so limited, that it is doubtful whether at this period, there could be any motions exercised analogous to those of deglutition.

The mucous membrane lining the mouth and tongue, does not present anything remarkable until about the sixth month; but at this time, and to the seventh, eighth and ninth month, it deserves some notice. It may be more or less colored, and more or less injected, agreeing with the general condition of the foetus; for in three individuals of this age Billard dissected, it was in one of a violet red, and in the other two pale red. From the seventh to the ninth month, the color of the buccal membrane is generally of a deep rose; the papillæ at the extremity of the tongue are more projecting, and those at its base better delineated and more prominent; the pillars of the velum, and the velum palati itself, present the arrangements of the parts which they afterwards have, and the distance with which they are separated from the external opening of the mouth, is evidently increased.

And again: The lateral parieties of this cavity are separated, and the lower jaw has become more moveable, so that at the sixth to the eighth month, the buccal cavity becoming larger, and the lower jaw admitting of more motion, it is possible that the child may execute some movement analogous to mastication or deglutition; this is indeed what really occurs, if we may judge from analogy and from the observations made on quadrupeds by Haller, and subsequently by Beclard.

At the period of birth, the buccal membrane is usually very red; it is the same with the tongue and gums; all these parts are injected with blood analogous to that of the external integuments; they might be pronounced inflamed on a superficial inspection, but against such an error we should be carefully guarded. They gradually lose this deep color, and soon acquire that of the rose, which is, for the most part, the color of the skin; for in fleshy children whose integuments are very pale, the buccal membrane, if it be not inflamed, is itself but faintly colored.

The salivary glands are scarcely visible during two-thirds of the foetal life; it is only towards the seventh month of gestation that they acquire any size. At first they consist of a few granulations which are blended with the cellular tissue; but at seven to nine months they agglomerate, and assume their proper form. Their excretory ducts open into the buccal cavity by an almost imperceptible opening. The sublingual gland appears to be developed first, then the submaxillary, and lastly the parotid.

At birth these glands are scarcely formed; but they are developed with great activity, and towards the seventh month, that is, when the incisor teeth appear, the sublingual and parotid glands are considerably augmented in size and furnish an abundant secretion. It appears as if their development and functional activity are more perfect in proportion as the mouth, and especially the gums, require to be moistened and softened. They develop earlier in fleshy and well-fed than in ill-conditioned children. This might be inferred when we remember that the secretion from these glands give an alkaline reaction.

MALFORMATIONS OF THE MOUTH.

Absence of the Mouth.—The malformations of the mouth, and those of the face in general, have been well described by M. Laroche. He correctly distinguishes between the complete absence of mouth and the obliteration of its anterior orifice. The absence of the buc-

cal cavity is called astomia, and the obliteration of the anterior orifice atresia of the mouth. The absence of the buccal cavity occurs when the bones of the face have been arrested in their development, and particularly when the lower jaw is wanting. This deformity cannot be remedied, and the child affected with it soon dies. Sometimes, M. Laroche observes, in the place of a mouth, an irregular opening is found, although situated lower, and communicating with the larynx and oesophagus. Borichius has seen, instead of the mouth, a hole in the right cheek.

In a very young embryo, five or six weeks old, for instance, the mouth is not closed, properly speaking; but the two lips are so closely approximated, and the labial orifice so narrow, that one can hardly be led to believe that an orifice exists. Yet the contrary may be easily ascertained by separating the lips with the point of a needle. The buccal cavity may then be easily distinguished, entirely filled with the tongue, which extends to the borders of the lips. In the natural state, this opening gradually enlarges, the borders of the lips cease to be contiguous; at about four months, the commissures are found to be on each side, on a line drawn perpendicularly from the middle of the eye-brows. Finally, at six, seven and nine months, this opening acquires a diameter corresponding in size to the other parts of the head.

Obliteration of the Mouth.—It sometimes happens that the borders of the lips, irritated and inflamed at some period of the intra-uterine life, contract and adhere either in a part or in the whole of their extent, and we can conceive, from this, the possibility of an incomplete or complete obliteration of the mouth. There exist but few instances of this malformation; when it is met with, it may be remedied by making, with a suitable incision, an artificial buccal opening, or by separating the adhesions which make it incomplete.

Acquired Microstoma.—A more frequent occurrence is contraction of the mouth from syphilitic mucous patches and chancres. The cicatrices contract more and more, till finally it is impossible to introduce a small spoon or even a tube. If the syphilis has been eradicated from the system by a mercurial treatment, the formation of the mouth may be undertaken according to Diffenbach's method. A myrtle-leaf-like piece of skin is excised from the cicatrix, at both sides of the constricted mouth, without injuring the mucous membrane, thus forming the future angles of the mouth; next the mucous membrane is cut through with the scissors clear to the angles, is lapped over the

edges of the wound, and united to the outer border by sutures. If the subjects are not marasmic, which, however, is their usual lot, after they have surmounted syphilis, the operation readily succeeds. In the contrary case, the mucous membrane will not heal, but becomes covered with an aphthous membrane, and the patients perish in an atropic state. (Vogel.)

MALFORMATION OF THE CHEEKS.

The different parts which constitute the buccal cavity, may likewise present some malformation. M. Laroche has pointed out as such the congenital fissure of the cheeks, of which Nicati has published two cases ; in one, the fissure was double, and extended from the angle of the lips, terminating at the globe of the eye ; in the other, it only existed on the right side. This last foetus presented besides, a division of the left lip, and a double insertion of the umbilical cord, one at the umbilicus and one at the head.

Were there not rather, two umbilical cords, and was not this a trace of the inclusion of another foetus ? These fissures probably depended on the slow union of the different pieces which compose the bone of the upper jaw.

These cases of malformation of the cheeks will need skillful surgical operations to close them ; even in these cases remedies may do more than we would imagine, as the following case recorded by Jahr demonstrates :

“A salivary fistula of six years standing, which had perforated the left cheek, and for which the patient had tried every kind of treatment in vain, was radically cured in a few weeks by means of a watery solution of two globules of *Calcarea 30* ; an improvement showed itself at once, in the first week, and progressed without interruption until a complete and permanent cicatrix had formed.” (Forty Years Practice.)

The Lower Jaw may be Wanting, or be of a remarkably small size. Billard saw a child born with all parts of the mouth reduced to extremely small dimensions. I record this curious case in detail :

“On the 25th of June, 1826, a young female infant was brought to the Hospice des Enfans Trouves. The inferior portion of the face was very much narrowed; and the two cheeks, instead of being round and projecting, were almost concave ; the opening of the mouth was very narrow, the lips round and prominent, the lower jaw projecting and extremely narrow ; the tongue straight and pointed, having altogether the form of a hare’s tongue ; the isthmus of the fauces was very narrow. The child could not take the breast, and drank with

great difficulty ; the imperfect deglutition caused sometimes a dangerous suffocation. The cry was acute and jerking, and both the parts constituting it, were distinctly heard. This child soon perished from enteritis, on which account it was placed in the infirmary. On the examination of the dead body, the various parts just enumerated were measured, and were of the following dimensions : The anterior orifice of the mouth was six lines in diameter ; the tongue, from the base to the point, two inches and two lines, and its diameter near the base, six lines, and at the point, five ; the distance between the two large cornua of the os hyoides, was seven lines ; and the distance between angles of the lower jaw was found to be fifteen lines ; the greatest diameter of the palatine arch was fourteen lines ; the ossification of the lower jaw was as much advanced as it usually is at birth, and the tongue possessed all its muscles."

Thus, all these parts were of their natural length, but not of their ordinary breadth, so that it may be said that the lateral portions of the face had been compressed in a manner to hinder their development in breadth. He could not find the cause of deformity in this child, who, in other respects, possessed a perfect organization.

Vascular Subcutaneous Nævus often occur towards the angle of the jaw, involving the parietal, and sometimes the submaxillary gland.

" In one case of this affection, in a healthy infant a few months old, I applied a ligature, which was tied around two strong pins passed at a considerable depth through the parotid. The part that was strangulated came away, and the wound healed, but the vascular growth had not been extirpated, and the disease returned.

In another infant, in which the disease was still more extensive, I first passed setons through the parotid without advantage, and then tied the common carotid artery. The temporary effect of the second operation was considerable ; but after two months, the vascular structure became again distended, and on the increase ; secondary hæmorrhage took place through an unhealed sinus leading to the point where the artery had been tied, and the child shortly afterward sank. If a similar case again presented itself, in a strong and healthy infant, I should be disposed to tie the external or common carotid, and to extirpate the tumor at one operation." Mayo, Surgeon, Middlesex Hospital, Pathology, p. 204.

The Homœopathic physician often finds *Thuja* the only necessary remedy for these hideous deformities.

DISEASES OF THE LIPS.

Of the various congenital deformities affecting the oral opening, the majority are comparatively rare, so that no extended discussion of them will be demanded.

ATRESIA.

This would naturally demand our earliest attention, consisting as it does in a complete occlusion of the mouth, by a more or less intimate adhesion of the lips, or their union by membrane. Should this condition be met, the attempt should first be made to break up any adhesions which might exist, by drawing the lips apart by means of the thumbs. Failing in this, the necessary opening may be made with the knife. Should the tissues divided have any considerable thickness, the more external parts should be pared away so as to leave the mucous surface sufficiently redundant to be reflected outward to meet the edges of the skin, and thus form a natural vermillion border for the lips. A similar mode of operation might be employed in *microstoma*, or abnormal contraction of the mouth, should gradual dilatation by tents or otherwise not prove effectual.

HARE LIP. LABIUM LEPORINUM.

By far the most frequent affection of this class, and practically the only one to engage the surgeon's attention, is hare lip, which is a malformation produced by an imperfect union of the different portions of the upper lip and jaw, during the earlier periods of embryonic development. "This congenital defect exists more often with hydrocephalia, anencephalia, or acephalia." (Billard.) In order to clearly understand the philosophy of its production, it will be necessary to study the process of development of the face, for which purpose see p. 198 or Flint's Physiology, Vol. V, (Reproduction,) pp. 414, *et seq.* It will thus be seen that the upper jaw consists of three segments, two lateral and one central. This central segment, usually called the "intermaxillary" or "incisive portion," develops as a distinct bone, but is joined intimately to the lateral portions during foetal life, and thus loses its individuality. This union, however, not infrequently fails to occur, for reasons as yet unknown, and in such cases a cleft

of greater or less extent is produced, sometimes extending through a portion or the whole of the upper lip only, and in others involving the bones also; and upon one or both sides of the intermaxillary bone.

The cleft therefore occurs upon one or both sides of the median line, and extends from the mouth upward towards or into the nostrils. It has been observed much more frequently in boys, and when single, much more commonly upon the left side. The reasons for these peculiarities we are, as yet unable to explain. In cases where the bones are involved, the "incisive" bone shows a marked tendency to project forward beyond the corresponding lateral portion, and more especially where the cleft is double; in which case the central portion sometimes projects even beyond the point of the nose to which it is frequently attached.

The operation for the correction of this deformity should ordinarily be undertaken at as early a day as practicable, in general within the first few weeks of life. There seems to be no necessity to justify such an operation within the first day or two after birth, before the child has fairly established an independent existence; but on the other hand, unnecessary delay should be avoided, especially if the deformity interferes with the child's nursing, and thus impairs the nutrition and general health.

In the case of a *simple or single hare lip*, in a young infant, the use of anaesthetics would be optional. Probably the risk would be somewhat less without than with them, since there would be less liability to strangling from blood being drawn into the larynx. The child can be readily held if snugly wrapped in a strong cloth and the head fixed between the knees. If necessary the frenulum of the lip may be divided so as to allow ready approximation. The lines of incision should be carefully estimated, so as to produce flaps of the same length, and to produce flaps sufficiently long to allow for cicatricial contraction. The simplest way of accomplishing this is by making each incision in the form of a broken line, with an obtuse angle, or a rather short curve, entering into each flap, thus leaving a lozenge or diamond shaped opening when the flaps have been finished. When these are approximated, a slight projection will result upon the border of the lip, which, if it has been accurately estimated, will be exactly removed by the process of cicatricial contraction; thus leaving a perfectly even lip instead of the notch which invariably results from the ordinary or straight incisions.

The instrument most convenient for this operation is a straight,

spear-pointed bistoury. The lip being seized by the fingers, or a pair of forceps, the flaps are first outlined by incisions commencing above, and penetrating only through the skin ; for the reason that by this method the cutaneous margins may be made more even and perfect than when the lip is transfixated at first. The flaps are then completed by transfixion, carrying the knife down in the line of the cutaneous incisions, and leaving the strips thus removed, attached by their upper ends until the incisions are completed below. Sharp, thin-bladed scissors might prove quite as convenient and successful, but would need to be made especially for this purpose.

The flaps having been prepared, and found to be of equal length, the haemorrhage can be readily controlled temporarily, by compression between the forefingers and thumbs of an assistant, until the sutures are introduced and closed ; after which there is usually no further trouble. Torsion might, however, be employed if required.

In spite of the long established and generally recognized use of pins for approximating the flaps in hare lip, I have no hesitation in discarding them entirely in favor of the interrupted suture ; believing that by this means the edges of the flaps are more evenly approximated and firmly held, that less ulceration and marking is produced and that the results are every way more satisfactory and more easily secured than by the pin suture, however employed. The material I invariably use, and can most heartily recommend, is that called " silk-worm gut," such as is employed by sportsmen in making fishing tackle. This combines all the advantages of silver wire and silk, with none of the disadvantages of either. In setting the sutures, either a staff needle or an ordinary curved needle held by a good needle forceps should be employed so as to be well under the operator's control. Two, or at most three, deep sutures will suffice ; they should be set well back, and embrace the whole thickness of the lip, so as to approximate the mucous as well as the cutaneous surface, great care being taken that they be evenly introduced upon the two sides, so as to accurately approximate the flaps. If the sutures are too loose, of course the wound is likely to draw apart ; but if too tight they will strangulate the tissues, cut through the flaps, and cause the cutaneous margins to roll inward or outward, and so prevent that perfect coaptation upon which the perfect success of the operation depends. It is usually best to close the lower suture first, so as to be sure of the even adjustment of the border of the lip. If there is a tendency to incurvation of the flaps upon the vermillion border, after

the closure of the deep sutures, a fine stitch should be put into the edge of the lip, to secure against this.

The dressing is completed by carrying rather narrow strips of silk isinglass plaster across the lip from cheek to cheek, and from the nose well down to the edge of the lip to protect it from injury in feeding or otherwise. After being applied, the plaster and the lip should be well moistened, at least twice a day, with a lotion consisting of four grains of *Chloride of Zinc* dissolved in one ounce of water and *Glycerine* equal parts. This renders them antiseptic, and prevents the plasters from curling or peeling off. This lotion, for which we are indebted to Prince, is of great value in all plastic operations when isinglass plaster is used. The plasters and the stitches may be removed after three or four days if the union is complete, or they may, if it seems advisable, be allowed to remain two or three days longer.

Should the edge of the central portion of the jaw project forward so as to present a sharp angle against the lip, it should be retrenched by strong scissors or bone forceps, at the commencement of the operation, and the rudimentary incisor should be removed so that it shall not later on give trouble, as it invariably would by growing out in a distorted position.

Double Hare Lip should be, when it is practicable, operated upon according to the same principles as the single variety. Should the central portion of the lip be too scanty to allow this to be done, and especially if the incisive bone project strongly forward, it may be necessary to utilize this portion of the upper lip to create a new septum nasi. The projecting incisive bone should be forced back, if possible, on a plane with the alveolar processes, upon either side. To do this will probably necessitate cutting through the vomer or possibly the removal of a wedge of this bone, forcing the incisive bone backward, and if necessary wiring it to the bone behind, to retain it in place till consolidation shall have occurred.

In some cases it may be necessary to cut away this intermaxillary portion entirely, thus converting the double into a single cleft. This would, necessarily, considerably diminish the size of the upper jaw, and should be avoided if possible. When the intermaxillary portion has been forced back, as above mentioned, the teeth, when they appear, will be directed considerably backward, and may require to be removed if troublesome.

A great variety of modifications have been devised and urged by

various operators, from time to time, and undoubtedly many special modifications may be demanded by individual cases; each of which must be treated according to its special requirements, or as the surgeon's judgment may dictate. (A. G. Beebe.)

HYPERTROPHY OF THE LIPS.

By simple hypertrophy of the lips, says Vogel, we understand a painless, uniform, chronic, exceedingly gradual swelling of the upper lip, especially of its vermillion border, so that in the most extreme cases, complete eversion takes place, making a hideous deformity.

Etiology.—Chronic swelling of the upper lip occurs almost exclusively in so-called scrofulous children. Notwithstanding the many attacks to which the idea of scrofula has been subjected, this fact remains: that a series of chronic inflammatory affections of the skin and mucous membranes, of the organs of sight, hearing and smell, of the lymphatic glands, bones and articulations alternate with each other, and that they are distinguished for their obstinacy. It is furthermore worthy of notice that these local processes are very little, if at all ameliorated by local treatment, while even though they have been of several years duration they rapidly disappear upon the establishment of a similar inflammatory or ulcerative process in any other organ. Chronic hypertrophy of the upper lip belongs to the most frequent manifestations of this nature, and is produced anatomically by simple hypertrophy of the mucous glands just described, or perhaps more properly there is an increase in the connective tissue composing the glands. The microscopic examination of such hypertrophic glands does not exhibit any trace of alteration of tissue, but only an increase in the volume of normal tissue. These glands may either swell spontaneously, or they may be affected by inflammatory processes in their vicinity, i. e., eczema of the nostrils and adjacent tissues, ozæna, or affections of the mucous membrane of the mouth. In these cases there is an excessive development of the connective tissue due to the transformation of the white blood corpuscles. The lymphatic system is very active in such cases. Scrofula is then a hyperactivity of the lymphatic glandular system. This hyperactivity is an effect, not a cause.

Symptoms.—Children thus affected show such a conspicuous disfigurement of the mouth, that the condition is recognized at a glance. The lower lip is usually less swollen than the upper, because the latter is more directly subject to the irritation emanating from the nose, and in cases of chronic catarrh, frequent blowing and wiping of the nose

and of the upper lip, constitute an additional source of mechanical injury. If the lip is taken between the thumb and index finger, and compared with a healthy lip, it is easy to satisfy one's self that it is considerably thickened. This examination is altogether painless, except when there are rhagades, or ulcerated fissures in the folds of the lips, which increase the swelling of the surrounding parts, and which, as a matter of course, are very sensitive under pressure. Hypertrophy of the lips seldom exists alone, but is usually complicated with eczema of the nostrils, and swelling of the alæ of the nose, with the above mentioned rhagades, or further with blepharitis, phlyctenular conjunctivitis, keratitis, with otorrhœa and wide-spread eczema. It is a noticeable fact that other dyscrasias, such as syphilis and lymphatic leukemia, whose favorite seat is also in the glandular apparatus, always spare the lips. In scrofula, on the contrary, the lips remain hypertrophied for years, or even for the entire lifetime, even when the neighboring diseases of the nose and mouth, which undoubtedly caused them, have long since disappeared.

The Diagnosis is of no special significance, because chronic swelling of the upper lip of many years standing, makes its appearance only in families of more or less pronounced tuberculous tendency, so that we have here a valuable indication of the deterioration of the individuals affected and their relatives. This affection is not to be confounded with congenital double-lip—*labium duplex*. In the latter a longitudinal ridge, hardly perceptible in the nursing, gradually develops itself under the vermillion border of the upper lip—seldom of the lower—this ridge being separated from the true lip by a furrow, and finally constituting a duplicature of the lip.

Other Tumefactions of the upper lip, the result of pachydermia, or acute diseases of the mouth and incisor teeth, cannot be confounded with chronic (or scrofulous) hypertrophy, partly because of their different aspect, partly because their course is by no means chronic.

This eversion of the mucous membrane consists, according to Forster, of hypertrophied cell-tissue, and enlarged lip glands. In another case Billroth found in this protrusion a cavernous framework, the meshes of which, however, contained lymph instead of blood, showing a structure analogous to macroglossia. The frenum of the lip usually withstands the eversion better than the remaining mucous membrane, so that the lip retains its normal form in the center, and the protrusion appears distinctly divided into halves. Sometimes this double lip is not at all remarked as long as the mouth remains quiet

and closed, but as soon as it is opened and extended as in laughter, the deformity appears.

Treatment.—The whole individual must be carefully studied to select the simillimum. *Belladonna* will be found most efficacious, and this whether the lip be soft or indurated. *Mercurius*, *Sulphur*, *Calcarea carb* and *Silicea* may also be indicated. *Calc. iod.* will be indicated if there is also enlarged lymphatics in the neck. *Baryta carb.* if the tonsils are also indurated. *Kali carb.* if also puffiness of upper eyelids.

MUCOUS TUMOR OF THE LIPS.

A mucous tumor is sometimes found especially on the upper lip of the new born. It is oval situated transversely on the internal surface causing a projection of the lip and consequently a disagreeable deformity. This tumor increases the size of the lips and exposes them to fissures and ulceration from atmospheric causes. It should be removed.

Treatment.—Knowing the action of *Calcarea phos.* and *Teucreum* on polypoid growths elsewhere these remedies may be tried before operating, especially if the tumor is not very large. If there is a suspicion of sycosis *Thuja* will be thought of. If remedies have no effect then recourse may be had to surgical means.

Bouchut advises that we wait till the child is six or seven years of age before operating, but as it is a simple operation, and the delay will be apt to occasion deformity of the alveolar arch, it should be removed as early as possible, after remedies have failed. The excision may be made with curved scissors, while an assistant holds the lips apart. The wound should be dressed with *Calendula*.

ULCERS OF THE LIPS.

This disease is of frequent occurrence in children, especially when they run out in the cold or wind. When persistent and severe and returns periodically they indicate a cachexia that demands careful attention. These ulcers are sometimes persistent. *e. g.*, "A lady and her infant suffered at the same time with a similar attack; the lips and cheeks were swollen, and patches of inflammation occurred upon the mucous surface, which formed painful, oblong ulcers. The infant recovered in two or three weeks. The mother suffered for several months. *Iodine* appeared to have more control than any other medicine. (Mayo's Pathology, p. 203.)"

As a preventive measure, it is very important to treat all ulcerations of the lips with great care, and to obviate any misplaced adhesions. For cracking and bleeding of the lips, the most efficient remedies in Jahr's experience were *Arsenicum*, *Bryonia*, *Carbo veg.* and *Ignatia*.

The author met a severe case of bleeding of the lips with congestion of the liver in an infant of syphilitic taint. *Nitric acid* controlled the haemorrhage, but the child died subsequently from anasarca.

In simple ulceration of the lips, Jahr has found *Belladonna* an efficient remedy, and if it did not help, *Arsenicum*. Where there is a disposition to a reappearance of these ulcers, *Sulphur*, *Silicea*, *Calcarea*, etc., given at long intervals, will be needed to eradicate this constitutional peculiarity.

Other remedies may be indicated. *Natrum mur.* 30 cured a humid sore at the commissure of the lips. (N. A. J. H., XXII, 123.) Hydroæ, like pearls on the lips, also call for this remedy.

GENERAL SYMPTOMS AND THERAPEUTIC HINTS.

Paleness of the lips denotes poverty of the blood, or hypertrophy of the lymphatic system, i. e., excessive alkalinity; it may be transient however, as in spasms, frights, fainting and chills. *China*, *Arsenicum*.

Redness of the lips is a healthy condition, but an increased, deeper or brighter, redness is found in feverish conditions, or in marked *acidity* of the primæ viæ. A high redness of the lower lip without fever, indicates *Sulphur*.

Bluish lips are met in cyanosis (*Arsenicum*, etc.,) and sometimes in bronchitis (*Tartar emetic*).

Dry lips denotes a feverish condition or inanition. Fever blisters (cold sores) are formed in intermittent fever and bronchial affections. *Natrum*, *Arsenicum*.

The mouth is kept open in coryza. Remedies indicated, *Nux vom.*, *Sambucus*, *Ammonium carb.* In fevers, dropping of the lower jaw, especially during sleep, is a sign of great exhaustion. This symptom very frequently indicates *Lycopodium*, *Muriatic acid*, *Arsenicum*, etc. The mouth is firmly closed in spasms. *Belladonna*, *Stramonium*, *Veratrum vir.*, etc. (Raue.)

*DISEASES OF THE TONGUE.**IMPERFECT DEVELOPMENT OF THE TONGUE.*

Instead of the normal oval form, the tongue occasionally displays an indentation at the apex (Cholet) or even a more extensive fissure. Complete splitting of the tongue, where two movable tubercles or bands are seen at the back of the mouth, is very rarely observed. Children thus affected, according to Bednar, are able to cry, and the sense of taste is said to be present. According to embryology, this is explainable in the following manner. The development of the tongue commences as early as the sixth week. It proceeds from the first visceral arch. When the bulbous ends of the visceral arch meet in the median line, and become united to each other, a small tubercle is seen to develop itself on the lower border of the posterior surface of the first gill arch, at the place of union of the two halves, which at first has a triangular, later, an oval form, and gradually becomes developed into an anteriorly curved, fleshy cone, (the tongue.) But, if this union of the visceral arch did not take place perfectly, and at the right time, that fleshy cone will remain divided, and, as an effect thereof, is retarded in its general development. (Vogel.)

The papillæ are said (Frey) to be rudimentarily formed in the third month. This organ has been seen deprived of all the muscles of one side (Laroche.) It may be defective in symmetry, and not exhibit the sulcus in the centre. (Billard.)

CONGENITAL ABSENCE OF THE TONGUE.

The tongue may be very small and hollowed like a canal (Haller), but is only entirely wanting in cases of absence of the face. In every other circumstance it exists in a rudimentary state, under the form of a tubercle of greater or less size, and adherent to the floor of mouth. It is the free portion of the tongue which is wanting. According to the degree of this deformity, suction is more or less interfered with, as well as deglutition, and at a later period articulation, if the child survives. Jussieu, however, has seen at Lisbon a girl fifteen years old, born without a tongue, and whose mouth only contained a tubercle three or four lines in height, in the shape of a nipple. She appreciated various savours; mastication and deglutition were slightly

difficult, according to the food ; the deglutition of liquids took place without difficulty provided the quantity to be imbibed at one time was not too considerable ; she could expectorate freely and spoke with the greatest distinctness.

Other cases of absence of the tongue after gangrene, consequent upon smallpox, have been observed among children by Aurran and Bonamy, and after great difficulties, suction, deglutition and articulation were observed to be acquired anew, doubtless incompletely, but in a manner sufficient for the accomplishment of the functions of nutrition and relation. The example by A. Pare is well known, in which an individual whose tongue was cut off, was observed to remain dumb for three years, and afterward acquired the power of pronouncing some words by putting a small piece of flexible wood in his mouth. (Bouchut.)

ABNORMAL ADHESIONS OF THE TONGUE.

In addition to the shortening of the frænum, there sometimes occurs an actual union of the whole lower surface of the tongue on all sides with the floor of the mouth, either congenital as a continuation of the embryonic union of the tongue with the floor of the mouth, of which the normal superfluity of the folds of the mucous membrane on both sides of the frænum, represents the so-called plica fimbriata, or acquired through syphilitic or mercurial ulcerations. Fortunately this now is a tolerably rare occurrence.

"Adhesions of the tongue," says Billard, "have been explained by saying that the same state is met with in the normal condition of the embryo. I have dissected with great care three embryos, of six weeks, two months, and of nine weeks, and did not find in either, the tongue adherent to the subjacent parts. It was very much developed and had no other adhesions, except at the base and frænum."

The tongue presents adhesions, first, with the palate, which is very rare ; second, with the floor of the mouth ; third, with the lateral parts of the alveolar arch ; and fourth, by its extremity on the median line by means of the frænum. (Bouchut.)

The separation of the entire tongue with the knife, is a very bloody operation, and often leads to no satisfactory results, if the after treatment, consisting in the constant introduction of pledgets of lint moistened with *Calendula*, and frequent passive motion of the tongue, is not assiduously carried out. The galvano-caustic promises better results.

TONGUE TIE.—ANCHYLOGLOTTIS.

Beneath the tongue is a very delicate mucous membranous fold, directed edgeways, and fixed behind the symphysis of the lower jaw; this is the *frænum*; it maintains and moderates the movements of the tongue, and prevents its too great elongation. If the *frænum* is too short, the tongue cannot be protruded and the act of sucking is impeded. The point is usually indented. This deformity interferes with nourishment by impeding suction, and deglutition; it is chiefly contraction of the *frænum* which constitutes tongue tie. Tubercles in, and hypertrophies of the *frænum* also occasionally occur and exercise the same effect upon the tongue. Sometimes the deficiency of the mucous membrane is so great that it passes at once from the floor of the mouth on to the tongue without the formation of any *frænum*. (Steiner.)

Diagnosis.—As M. Petit observes, there are many children who are said to have tongue tie, yet have it not. We must learn then how to discern its existence. When the fingers cannot be passed under the tongue of the child, if this organ cannot be raised to the palate, if the suction of the finger is obstructed, the *frænum* is too short. It must be cut. However, if notwithstanding all this, the child takes the breast well and sucks easily, the operation is useless. Cases of delayed speech in children three or four years old are often explained by non-medical persons on the ground of tongue tie, the real origin of which lies in deaf-mutism, in chronic hydrocephalus, or in disturbed or delayed development of some special part of the brain, probably of the sylvian fissure. If on the contrary, the child takes the breast, seizes the nipple imperfectly, looses from it noisily, constantly makes a noise in sucking in consequence of the impossibility of the tongue clasping the nipple, allows the milk to run over the edge of the lips, it does not suck, and the operation for tongue tie is sufficiently indicated.

Treatment.—This very easy operation presents some danger from haemorrhage and falling back of the tongue, when it is done by a timid or unskillful person. The usual operation is as follows: “The child is put in a sitting posture the head thrown back and confided to one who will not be intimidated by its cries. The surgeon raises the tongue with the fingers or with blunt forceps and holds it up. His other hand, armed with probe pointed scissors, the points being directed downwards, to avoid the ranine arteries rapidly accomplishes the section of the *frænum* to the extent of one-sixth of an inch at most. The wound does not require any attention, and it is seldom

that the child suffers from it after a few hours; it very quickly heals."

"Hæmorrhage sometimes follows this operation, when an abnormal distribution of vessels exists, or if the ranine artery or a large vein have been divided. It is kept up by the movements the child makes in suction which may cause it to be very considerable. Steiner saw two such cases which resulted fatally. The point whence the blood proceeds should be cauterized with *Nitrate of Silver*, *Sulph. acid*, or the actual cautery, in the shape of a wire heated in the fire. Here, also a hæmostatic application of *Persulphate of Iron*, styptic cotton, etc., may be used. In order to arrest this hæmorrhage, it is sometimes sufficient to place the child in perfect rest, by preventing, by a very simple process, the movements of the suction of the tongue. When the operation is terminated, in order to prevent the child sucking its tongue, we must compel it to keep the mouth open. To insure this, it is sufficient to send it to sleep by closing its nostrils with forceps like those used to pinch leech bites. The child then respires through the mouth, and at the end of some time the hæmorrhage is arrested. This means which I have only employed once, was completely successful." (Bouchut.)

Another accident, more rare, but more peculiar to the operation of tongue tie, is turning back of the tongue in the pharynx. M. Petit has reported several very striking examples of this. This never happens except after too extensive a section of the frænum, and in this case it is a very serious accident which may lead to death by suffocation. By means of forceps the child should be prevented from thus drawing back the tongue; and if that does not suffice, a plate of metal in its place by an apparatus should be fixed on the tongue to keep it motionless. (Bouchut.)

A much more simple operation, and one that [the author has found very successful, is to press the finger nail upon the frænum, with the thumb under the chin, and thus forcibly tear the frænum from its attachment. It may separate at the tongue or jaw, or it may divide in the centre. There is little or no hæmorrhage, the attendants are not frightened and the child's short cry is soon hushed. The application of *Calendula* (one drop to a half cup of water) may be resorted to, if there is any tendency to ulceration, as may exist in some children.

The frænum may be too long as well as too short, and allow the tongue too great room for motion. It may be protruded as in hypertrophy, in fact causing that trouble, or it may occlude the pharynx giving rise to difficult deglutition and dyspnoea.

HYPERTROPHY OF THE TONGUE.

Some children are born with considerable enlargement of the tongue, which fills the mouth, protrudes and hinders suction.

"The Vandermonde *Journal of Medicine and Pharmacy* (Maurant's) contains an example of a child born with a monstrous tongue. After the birth of this child, this organ appeared much longer and thicker than usual, and entirely prevented sucking. The surgeon in attendance having examined it, found that it adhered to the gums and lower jaw by a spongy tumor of the size of a small filbert. He tried by all means in his power to separate the tumor from the tongue, but the haemorrhage which was considerable, intimidated him. The part which he had begun to separate afterward united, the tumor increased in size from day to day, and affected the tongue, with which it appeared to unite itself; and after a short time no difference could be perceived between the tumor and the tongue. During this interval the child lived only on liquid aliments, which were introduced far into the mouth to enable it to swallow, which it accomplished by drawing the lower jaw farther back than the upper. In this manner it took the breast; and it was quite a pleasure to observe with what quickness and dexterity this young infant, instructed by its wants, advanced and drew back the lower jaw in drawing at the breast. In proportion as the child increased in age the tongue increased in size; at last it was two inches thick, and projected four fingers breadth from the mouth. The incisors and canine teeth fell out; the lower jaw was bent in the middle, and presented a hollow in which the tongue was lodged. The child could chew and articulate sounds in spite of this infirmity. This child ought to have been relieved by perforating the tongue and passing a double ligature, which, being tightened gradually on each side, would have detached, by degrees, the superfluous appendages without haemorrhage. This operation has been performed with success on an adult."

Sometimes there is only a slight hypertrophy and a projection of the tongue under the dental arches. Vogel says "The tip of the tongue only is seen protruding beyond the lips at birth; the protruding piece, however, if nothing is done, will increase in size from day to day, such children are unable to suck, and also are hindered in swallowing, for the tongue not only hypertrophies anteriorly, but also in width and thickness. This enlargement of the tongue is usually combined with cretinism. When the dentition period arrives, the incisors are prevented from assuming their perpendicular position, and are directed obliquely forward. The constant pressure of the teeth produce an intense infiltration of the tongue; it ulcerates, becomes furrowed, the saliva constantly flows down over it, undergoes decomposition, and diffuses a disgusting, sour, rancid, fatty smell. In cases of many years duration, the inferior maxilla forms a gutter, in which the ulcerated or dry tongue lies. The lower lip becomes everted, and the acquisition of distinct speech is wholly impossible. This condition is also met with in children well developed in other respects, who have frequently suffered from convulsions, by which a weakness or partial paralysis of some of the muscles of the tongue may remain."

The children should be taught the habit of keeping the tongue in,

by applying on it, each time it projects, a little alum or pepper. This will prevent the tongue from being bitten, and its ulterior enlargement. At the same time the children should be provided with large nipples so as to prevent a too considerable movement or elongation of the tongue. If the nurse has not this configuration, recourse must be had to a sucking bottle, the end of which is of large size.

Treatment.—If the evil is recent, and the tongue reducible, the cure is soon affected by dusting powdered alum on the protruded part, or painting it with tincture of *Arnica*. If the mucous membrane is already ulcerated, the projecting piece will have to be removed by a surgical operation. Hitherto the ligature or knife was employed in this operation, in most instances it is now performed with the ecraseur but most quickly and elegantly with the galvano-caustic apparatus.

GLOSSITIS.

Simple glossitis or inflammation of the tongue is sometimes met, rarely as an idiopathic disease, when it does the very best remedy is undoubtedly *Merc.*, next to which Jahr ranks *Lachesis*, and likewise *Apis*, which Jahr used with great effect in one case, together with *Merc.* The cure is sometimes completed by *Bell.* if *Merc.* no longer improves the case. In phlegmonous glossitis Hempel suggests *Aconite* as indispensable. Compare *Arsenicum*, *Cantharis*, *Sulphur*.

HYPERTROPHY OF THE MUCOUS MEMBRANE OF THE TONGUE.

Dr. Mayo, surgeon of Middlesex Hospital gives a case of this kind as follows: "The patient was a lad, and the disease had existed three years. The middle half of the left side of the upper surface of the tongue is the part affected; it is elevated to the height of a quarter to a third of an inch, where it is thickest. The prominences are not uniform, but toward the back part is divided by two or three fissures into separate eminences. The surface is soft, moist and of a reddish grey, but has more of grey in it than the opposite side of the tongue. There is no pain or soreness of the part, or sense of taste in it." He found that "the swelling lessened under the daily application of *Hydrargyrum cum creta*, and shrank a little upon two or three applications of *Nitrate of Silver*. The first was discontinued, when it affected the mouth; and the caustic because it began to irritate. I have prescribed nothing recently for the part as the patient has phthisis." The treatment of such cases should be constitutional. (See *Glossitis*.)

GLOSSALGIA.

Glossalgia or pain in tongue is not often met in children, especially apart from one of the other diseases. Jahr records his experience

as follows: "In two cases of this kind that I have had to treat, one of which was characterized by an intense ulcerative pain, and the other by an intolerable feeling of soreness as if scalded, the former case was cured by *Calc.* and the last by *Caust.*" (Forty Years, p. 110.)

PSORIASIS.

Psoriasis of the sides and edges of the tongue is characterized by patches of whitish, sore, excoriated surface about half an inch in diameter. It is most common when slight degrees of syphilitic taint exists; but it occasionally occurs in cachexia from no specific cause. (Mayo's Pathology, p. 199.) This is a local manifestation of a constitutional taint, and demands a carefully selected constitutional remedy, and usually a change in diet.

ULCERS OF THE TONGUE.

A peculiar disease of the tongue was met with in a boy by Eberle. Clusters of very minute transparent vesicles pervaded the whole thickness of the tongue, occupying nearly one-half, and projecting considerably both on the upper and under surface. The slightest injury caused them to bleed profusely. In some places the clusters were separated by deep clefts, which discharged a foetid irritating sanies. This discharge which had resisted various plans of treatment, both local and constitutional, gradually yielded to quiet, cleanliness, and large doses of *Hyoscyamus*, which were increased to a drachm of the extract daily (Mayo's Outlines of Pathology, p. 200.) This extract could not have been worth much, or the patient would have "yielded" first. We are not disposed to see a similia in every case followed by recovery, but possibly the *Hyoscyamus* had something to do with the cure; its pathogenesis would indicate as much. The remedy that seems to be more nearly allied to this case is *Phosphorus* or *Thuja*.

In the treatment of ulcers and indurations, Jahr gives his experience as follows: "For induration in the substance of the tongue, *Mercurius* is very often the best remedy, likewise *Belladonna* and even *Silicea*. *Bryonia* may likewise be given with good effect." *Conium* may be indicated, also *Phytolacca*. Indolent or "cancerous ulcers require above every other remedy *Arsenicum* or *Silicea*; both of these remedies cure such ulcers with tolerable speed, provided they are not spread too far." *Hydrastis* is a remedy that should not be forgotten.

GENERAL DIAGNOSTIC AND THERAPEUTIC HINTS.

Symptomatic Hints.—In the infant during health the mouth is closed, the tongue cleaves to the roof of the mouth and is moist, smooth and

generally covered, in its middle and toward its root, with a thin coat of whitish mucus. The mouth is always moist and of a palish hue, and the gums of a bright red color.

When the tongue is loaded with a white curdy matter, disturbance of the digestive process, or a slight irritation of the alimentary canal, is generally present, usually the coating is not very heavy. Increased redness, heat and dryness of the tongue and parieties of the mouth, indicate the first stage of stomatitis, and often accompanying inflammation of the alimentary canal.

Small points, or patches, dispersed over the tongue and parieties of the mouth, are the result of inflammation of the epithelium of these parts, and is usually symptomatic of disease of the stomach or bowels, as a local affection, or it may be produced by confined and impure air, want of cleanliness, etc.

Aphthæ of the tongue and mouth, are the result of follicular inflammation; they may depend on improper food and vitiated and confined air; or they may be developed by dentition, or be symptomatic of disease of the alimentary canal.

A pale, flabby tongue is the indication of great debility or exhaustion.

Redness of the tongue is symptomatic of acute inflammation of the gastro-intestinal mucous membrane.

In febrile diseases, and in most of the affections of the alimentary canal, the tongue is covered with a whitish coat. In protracted irritations of the bowels, the coating of the tongue generally assumes a dirty yellow or brownish color.

Increased secretion of saliva occurs immediately preceding, and during the process of dentition, and in the course of stomatitis it is also a common precursor of the gangrenous affections of the mouth in children. Increased heat and redness, with swelling of the gums, occurs at the period of dentition. A dark, red, and tumid state of the gums, generally precedes the occurrence of gangrene of these parts.

A large, long tongue is most conspicuously found in chronic hydrocephalus and cretins.

A small, thin tongue is found in atrophy.

A gradual diminution in size denotes gravity, and is a sign of a dangerous affection of the brain. (Sprengel.)

A broad tongue is found in rachitis, scrofula, (so called) inclination to abdominal affections and in intermittent fever.

A thick swollen tongue is found in rachitis, cretins, chronic hydro-

cephalus, obstinate dyspnœa, chronic inflammation of the stomach, catarrhal affections. Mercurial salivation, inflammation of the tongue, and after death from strangulation or suffocation.

A *swollen and heavy tongue* in croup, pleurisy and pneumonia is a bad sign; just as its sudden diminution, without improvement of the other symptoms. (Hippocrates.)

Pityriasis linguae (map tongue) consists of white islands or circles or semicircles, the rest of the tongue being of a normal rose red tint. These spots are made up of an accumulation of epithelial cells.

In atrophic children transverse fissures are often seen upon a very smooth, red tongue; the fissures present deep yellow bases and obstinately resist treatment. In fatal cases they do not disappear before death.

The appearance of the tip half of the tongue is the most significant in a diagnostic point of view. It should be in a normal condition, moist, pale red, and slightly coated white.

Therapeutic Hints.—A red tongue all over, with considerably raised papillæ—*Belladonna, Tartar emetic.*

A red, glistening tongue—*Kali bich., Lachesis.*

A red tip in the shape of a triangle—*Rhus tox.*

A red, undefined tip and red borders—*Sulph.*

A lead-colored tongue—*Arsenicum.*

A bluish tongue—*Digitalis, Arsenicum, Muriatic acid.*

A whitish coat on one side of the tongue—*Rhus tox.*

A whitish coat on both sides—*Causticum.*

A whitish coat in the middle only—*Phosphorus, Bryonia.*

A whitish coat on the root strongly marked—*Sepia.*

A general thick white coat—*Bryonia, Antimonium crud., etc.*

A map tongue—*Arsenicum, Lachesis, Natrum muriaticum, Nitric acid, Taraxacum.*

A dry red tongue cracked at the tip—*Lachesis, Rhus tox., Sulphur, Kali bich.*

A dry tongue, without thirst—*Bryonia, Pulsatilla.*

A soft tongue, with imprints of teeth—*Mercurius, Rhus tox., Stramonium.*

A clean tongue with gastric and other derangements—*Cina, Digitalis.*

A trembling of the tongue—*Lachesis.*

A trembling of a heavy tongue—*Lycopodium.*

An involuntary darting of the tongue, out of the mouth, and moving it between the lips to and fro—*Lycopodium.*

Perfect paralysis of the tongue—*Baryta carb.* (Raue.)

*DISEASES OF THE PALATE.***CLEFT PALATE.—STAPHYLORAPHY.**

Associated with harelip, or, occasionally, independently of that deformity, an imperfect closure of the roof of the mouth occurs. This may involve the soft palate only, or the hard palate, or both. Ordinarily, if but one portion is affected it is the soft palate; but the more common variety presents a fissure extending from a harelip through the alveolar and palatal processes back through the hard and soft palate to the pharynx, thus opening upward into one or both nasal fossæ throughout. If only the velum palati is split through, it is technically designated "cleft palate;" if the bones are involved "fissure of the palate;" but the former term is generally employed to embrace both conditions.

TREATMENT.

While something may be done, in early infancy toward narrowing a complete fissure of the palate, by forcing the two sides of the jaw together, by means of Hainsby's truss, or some similar device, or merely by closure of an existing harelip; of course operative measures offer the only really curative resource.

In some cases the deformity is so extreme, and the remaining tissue so entirely inadequate to fill the gap, that all ideas of surgical interference or cure must be abandoned. Other complications might also arise to necessitate the same conclusion. In a large majority of cases, however, we may hope by skill and patience, displayed at the proper time, to effect a partial, and in many instances, a complete cure.

Having decided upon the practicability of an operation, the question as to the most favorable time should next demand our attention. Upon this point there has been no little discussion, and considerable difference of opinion still exists. The desirability of an early cure is conceded by all. Undoubtedly the tissues are much more plastic in early life, and when a cure can be effected, the parts develop into a much more natural condition than can ever be secured in later years. The difficulties, however, which surround such an operation upon young children, and conspire to defeat success, are such that they

have seemed to most operators insurmountable ; at least until the introduction of the improvements of the last few years. The employment of anaesthetics is also beset with such dangers and difficulties that few operators have had the courage to employ them. Indeed there is probably no other operation in surgery which is so involved in mechanical difficulties as that of closure of clefts of the roof of the mouth, especially in childhood. It is not remarkable, therefore, that many surgical writers have advised that no operation of the kind should be attempted until the patient is able to voluntarily assist the surgeon in the operation, and in the subsequent protection of the parts. Doubtless, operations may be made successfully, in early childhood, especially by the later methods ; but the surgeon who undertakes the task needs to look the difficulties and dangers fairly in the face before he commences, and be prepared for failures and disappointments, as they will probably outnumber his successes.

The patient must be seated, in a somewhat inclined position in front of a large, well lighted window. The jaws must be held well apart and the tongue depressed by a suitable gag, like that of Whitehead, and a dextrous assistant should be provided with a number of small sponges fixed to handles, for keeping the mouth and throat cleansed of blood and mucous. A second assistant will be required to keep these sponges cleansed and ready for use. Very much of the ease and success of operations depend upon the dexterity with which the sponges are handled, and if an anaesthetic is to be employed, the patient's life may also depend upon this, as the blood is very apt to be drawn into the trachea, and produce fatal results. *Chloroform* seems to be the only available anaesthetic, as the administration of *Ether* requires the patient's mouth to be too constantly covered by the inhaler. On the other hand the sitting posture is not desirable in using *Chloroform*.

If the operation for closure of cleft of the soft palate only (Staphyloraphy) is to be undertaken, the surgeon, seating himself in front of the patient, seizes the free angle of one of the flaps with a long slender forceps, and putting it upon the stretch, enters the point of a sharp curved or straight bistoury a little to one side of the anterior angle of the cleft and smoothly pares off a narrow strip from one side, then from the other, detaching these parings from the apex of the angle, last. When this is done and the bleeding stopped, by ice water, if necessary, he proceeds to introduce the sutures. For this purpose several ingenious needles have been devised, but it is doubtful if any

of them will prove practicable in all cases, on account of such great differences in the conformation of different mouths.

Probably none is more certain and satisfactory than a short, strongly curved needle, (perhaps three-fourths of an inch long and bent into a semicircle) carried by a long and strong needle forceps. Simm's scissor-handled needle forceps and shot compressor seems to me to be the most satisfactory instrument of this kind. The shaft of the needle should be somewhat square so as not to turn in the forceps, in whatever position it may be grasped. Silver wire is probably the only satisfactory material for sutures, here, as silk cuts out and "silk worm gut" is not readily secured in this position. The wire may be introduced with the needle or may be drawn in by a double silk thread carried by the needle, as may seem most convenient. Several needles being suitably armed, and the flaps upon one side being steadied by a long forceps, the needle is carried through from before backward, and sufficiently away from the edge to secure a firm hold. As it shows its point in the pharynx, it is seized and drawn through by the second forceps, is again grasped in a suitable position by the needle holder and carried through the other side from behind, forward, and at a point exactly opposite to its first point of entrance. Having, in this manner, introduced a sufficient number of sutures to secure accurate approximation of the edges, (usually about one in every quarter of an inch) we may then proceed to close the sutures. This may be done by simply twisting the wire in the ordinary way, commencing with the most anterior one. This may in some cases, where the flaps are thin, result in twisting the loop of wire in the flaps so as to "pucker" up their edges. To obviate this difficulty, we may resort to Bozeman's button suture, or some modification of it. This has the advantage of supporting the edges upon either side of the suture and securing their accurate co-apportion, but it also prevents the free inspection of the parts. The ordinary shot suture is perhaps as generally available as any. A perforated shot is slipped over the ends of the wire and pushed down sufficiently far to approximate the flaps when the shot is compressed upon the wire by suitable forceps, the ends of the wire are cut off about an eighth of an inch from the shot, and the remainder bent down to more surely guard against slipping. Whether the silk worm gut could be secured by shot or not, remains to be demonstrated.

It only remains now, to prevent tension upon the stitches by dividing the tensor palati muscles or other tissues which may be put upon

the stretch. This may be done by a bistoury or scissors, making an oblique incision just within the pillars of the fauces upon either side, and may, of course, be done before closing the cleft, should it seem necessary.

Great care should be exercised in feeding the patient, until firm union has been secured, to avoid solid food, and to keep the parts as entirely at rest as possible. Coughing, crying, vomiting, etc., can hardly fail to seriously jeopardize the result. The sutures should be allowed to remain until firm union has occurred, or until no further benefit can be derived from them. Usually from four days to one week will suffice. Should only a portion of the flaps unite by adhesion, we may still hope, by supporting the parts and stimulating the edges by *Nitrate of Silver*, to secure considerable additional union by granulation. Indeed small openings may be closed alone by the repeated application of this substance, or of strong *Nitric acid*, sufficient to denude the surfaces of their mucous membrane.

Should union entirely fail, we may hope, by thus stimulating granulations, to secure additional thickness and fullness of tissues, so as to make a second operation more successful. It is probable that few cases could resist repeated and patient efforts toward a permanent cure.

FISSURE OF THE HARD PALATE—URANOPLASTY.

When the closure of a fissure of the hard palate (*Uranoplasty*) is to be attempted, the same rules apply as in *staphyloraphy*, with the exception that according to the ordinary method, the soft tissue must be also dissected off from the roof of the mouth. This dissection should be done by some rather blunt instrument, so as to include, if possible, the periosteum with the mucous membrane, thus securing thicker and firmer flaps and the possible filling in of the fissure by bony material.

Sir William Fergusson first devised and practiced an improved method of operating, (November 1873) which avoids most of the difficulties of previous methods, and bids fair to revolutionize our practice in this respect. He made an incision directly through both soft tissue and bone about a quarter of an inch from the margins of the cleft upon either side and parallel with them. These strips of bone with their overlying membranes, having been pared upon their opposing edges, were forced together in the median line and held in apposition by a wire thrown around them. The gaps thus left upon either side were found to be readily filled by granulations. The

advantages of this operation are too obvious to require comment, and must render the results much more certain in all cases where it is practicable. When the vomer is attached to one side of the fissure, as sometimes occurs, this method does not seem practicable. Unfortunately there are many cases where the width of the cleft renders hopeless any attempt to fill it with the scanty tissues to be found on either side. As to the question of attempting to close both the hard and soft palate at one operation, much difference of opinion exists and much must be left to the judgment of the operator in each case.

Where no operation is deemed advisable, much benefit may be derived from obturators of hard and soft rubber, which shall serve to fill the bony cleft, and act as an artificial velum. These, of course, are useful only for patients sufficiently advanced in age to be able to manage them intelligently, and can only be successfully made and adapted by a skillful dentist, who has given this subject some study.
(A. G. Beebe.)

PALATAL ABSCESS.

Large palatal abscess in children of a very distinct character sometimes occurs. Salter says: "I have generally seen it in children about two or three years of age, whose temporary teeth have decayed early. When the abscesses caused by temporary teeth point on the labial or buccal surface, there is seldom, I believe, anything remarkable about them, excepting that they are apt to denude and free the extremity of the tooth's fang. When, however, the matter is formed towards the palate, the swelling is often much more considerable than in an adult, and from its great size and formidable appearance, might convey an erroneous impression as to its nature. I have seen one of these swellings completely fill the hollow of the palate, passing across the median line and leaving but a narrow space between its convexity and the concavity of the palate on the opposite side. The amount of suppuration, as far as I have seen, is disproportionately small in relation to the size of the tumor; which indeed appears to be mainly produced by a sero-plastic effusion beneath the mucous membrane and fibrous tissue covering the palate." *

Treatment.—Removal of the offending tooth, with or without a scission of the tumor speedily relieves it. *Mercurius viv.* often arrests this abscess. If suppuration threaten, *Hepar* will be indicated.

* *Dental Pathology and Surgery*, p. 244.

CONGENITAL VAULTED PALATE.

This is a condition where the palate arches very high. The mouth is usually narrow, and in fact the whole face and head is narrow. There seems a lack of bony development, while the cartilages, as a rule, are abnormally prominent. An English physician found this condition of the palate in nearly every case of congenital idiocy examined by him. In the cases examined by the author, the malar bones were poorly developed. The speech was indistinct, as would be expected, especially in sounding those letters where the tongue strikes the roof of the mouth.

There is no reference to this subject in any work on diseases of children.

This is a congenital defect that should be early recognized, and the diet should be directed to developing the bony system. If there is also present an imperfect cerebrum, attention should be given to quicken mental action. The two remedies that promise most in these cases, are *Calcarea* and *Phosphorus*. Perhaps *Calcarea phos.* would be all-sufficient. This remedy might be given one day, and *Sulphur* the next, as recommended by Grauvogl in cases predisposed to hydrocephalus. The action of these remedies on nutrition is often wonderful. The food should be well salted.

SLOUGHING OF THE SOFT PALATE,

Also of the lips and cheek, occasionally supervenes in weakly infants. It is commonly fatal. (Mayo.) This condition may arise from malnutrition, or from constitutional taint, or both. In the former, proper food may arrest the ulceration, while in the latter such remedies as *Sulphur*, *Mercurius*, *Arsenicum*, *Kali*, etc., may tend to arrest the disorder.

RELAXED PALATE—ELONGATED UVULA.

“Falling of the palate,” or “swallowing the palate,” is a common term for elongated uvula, and is mentioned here for the sake of completeness. Swelling and relaxation of the soft palate and uvula are almost always more or less present in tonsilitis or pharyngitis. But there is also a chronic enlargement and elongation of the uvula, which is very annoying, especially if the elongation is very great. Sometimes this little body is enlarged so that it lies like a finger upon the tongue, causing a constant hacking, choking and swallowing, except when lying on the back. If very severe ulceration may supervene.

Treatment.—The old method of treatment was excision, but the

action of our remedies renders this means rarely, if ever, necessary. If the swelling is of a bright, shining redness, and the attacks come on suddenly *Belladonna* will be indicated. If the swelling is œdematoous *Apis* is strongly indicated. Other remedies, as *Aconite*, *Lachesis*, *Mercurius*, *Phosphorus*, *Coffea*, *Croton tig.*, *Nux vom.*, *Natrum muriaticum*, which have a marked action upon the soft palate and uvula, may be studied. The constitutional symptoms should also be taken into account, in chronic elongation of the uvula.

ABSENCE OF THE UVULA.

The uvula may be partially or entirely wanting. (Wedel). This condition is sometimes present in cleft of the palate and uvula, but it also may be absent from birth.

DISEASES OF THE SALIVARY GLANDS.

The normal and abnormal conditions of the glands of the mouth upon health or disease in the infant, have not received that attention by paedologists that they merit.

Billard dismisses them as follows: "The salivary glands are rarely diseased in young infants; they do not grow rapidly nor exhibit any functional activity, except at the time of the appearance of the first teeth. I often dissected them at this time to ascertain precisely their condition, but without being able to discover anything worthy of remark. I have often met the parotid gland bathed in blood, which condition was connected with a sanguineous congestion of all the surrounding parts."

The glands of the mouth, as we have seen, are composed of two sets, viz.: two parotids, submaxillary, and sublingual glands, and also numerous mucous glands. These are all *racemose* glands and differ only in size.

The latter correspond to the sweat glands of the skin, and are thickly scattered all over the mucous membrane, being most numerous in the lips, cheeks, and soft palate. These little glands measure in diameter from .45 and .23 down to .0564 mm, and are usually situated in rows, beneath the true mucosa, sometimes so thick as to form a regular glandular stratum. Their short, more or less straight, ducts penetrate the mucous membrane where they pour out their secretion. This secretion is alkaline, and varies in quantity according to the age of the child. The influence of these glands in stomatitis will be seen when studying those diseases. The integrity of the salivary glands has a marked bearing upon the nutrition of infants, as we shall see when studying the effect of the saliva upon the food. It is scanty in infancy, and increases in quantity, and reaches its maximum about the eighteenth month.

If scanty, the teething process will be difficult, for it is generally believed that the action of the saliva softens the alveolar tissues, and thereby facilitates eruption of the teeth.

If the saliva is poured out in too great quantity, it forms a stubborn, and often obscure disease of infancy, that has not received the attention that it must have.

SALIVARY CATAARRH — PTYALISM.

Ptyalism, or drooling, is a frequent symptom in infancy, and one that has been lightly estimated. It is without doubt an index of the excited condition of the salivary and buccal glands, that is pathological. As we have already intimated, the absence of saliva retards dentition, so also does a hypersecretion. When the saliva flows out of the mouth in almost a constant stream, it produces a drain upon the system that seriously interferes with nutrition. This condition is known as ptyalism, and although often due to *Mercury*, still it may arise without it. A cold may cause this form of catarrh, but it is more frequently excited by the eruption of the larger teeth. I am satisfied that one of the ill-effects of profuse salivation, or sialorrhœa, is to produce a cartilaginous condition of the gums. While a mild secretion of saliva without doubt softens the gums, an excess produces a toughness of the tissue, due to the great abstraction of fluid.

Insalivation.—The older the child, the less apparent is ptyalism during dentition. Because the child does not "drool," we must not conclude that this form of catarrh is not present, for the flow may pass down the alimentary tract, and escape observation, giving rise to serious trouble, as the following case illustrates :

George, youngest child of the late P. P. Bliss, aged eighteen months, had suffered all summer with diarrhoea. Had frequent changes of diet, air and physicians, but steadily grew worse. The stools were profuse, frequent and watery. The odor was like that of decaying meat, scented with onions. Although the child had been fleshy, the fifteen to twenty passages per day, for months, had reduced him to a mere skeleton. Being a fleshy, alkaline child, I sought for the cause of this severe and protracted lienteria, among the glands. After trying various remedies and forms of diet, I at last concluded that as there was a garlic odor,* and that a severe ptyalism had been suddenly arrested months before this, that this salivary secretion was pouring down the alimentary canal, giving rise to these profuse and frequent stools. He was at once put upon a starchy diet, mainly, and *Creosote*, and the whole trouble was arrested. The saliva began to appear at the lips, and this was followed by the easy and rapid eruption of four tardy molars.

Treatment.—In the treatment of this catarrh, it will be best, doubt-

*The odor of onion is attributed to the presence of the *Sulphocyanide of Ferrum*, while the active principle of the saliva is supposed to be the *Sulphocyanide of Potassium*. The cyanide uniting with the albumen might give rise to this odor.

ess, to put the child on a starchy diet exclusively for a few days, and then return gradually to more nutritious food. If the food has been starchy, a change to milk, or one of the dextrin foods, may be necessary. In the selection of a remedy we should remember that these glands belong to the grand glandular system, and that remote symptoms must not be overlooked. The principle remedies are *Mercurius*, *Nitric acid*, *Natrum mur.*, *Helleborus*, *Creosote*, *Iodine*, *Dulcamara*.

Mercurius has excessive flow of saliva, fetid breath, looseness of the teeth, or sponginess and shrinking of the gums from teeth already present. The tongue is large, pale and flabby. There should also be present high-colored urine. Worse in the evening

Nitric acid would be indicated if the trouble arose from poisoning by *Mercury*. *Belladonna*, *China*, *Dulcamara*, *Hepar*, *Iodine*, *Lachesis*, *Opium* and *Sulphur* are also given for the abuse of *Mercury*.

Natrum has ptyalism, with stiffness of the tongue on one side.

Creosotum, sour taste of the secretions of the mouth and stomach, with frequent vomiting. Decay of the teeth.

Iodine is a glandular remedy that should always be consulted in these cases, especially if there is also tabes present.

Dulcamara is indicated where there is a constant disposition to relapses from taking cold. Jahr says :

"For ptyalism (from cold, rheumatism, etc.,) I know of no better remedy than *Dulcamara*. Some time ago I had an opportunity of witnessing the marvelous curative powers of this drug in the case of a girl who, in consequence of her sleeping under an open window, was attacked with stiffness of the lower jaw and profuse ptyalism. The saliva flowed unceasingly day and night, causing a cluster of blisters from the mouth to the chest. Having made vain efforts to discover the true cause of this trouble, I gave for eight days *Mercurius*, *Kali chlor.*, *Natrum mur.*, *Nitric ac.* and *Phos.*, in all possible doses, when I accidentally obtained a true knowledge of the cause that up to this time nobody had thought worth mentioning. I now gave *Dulcamara* 30th, two globules, after which the flow of saliva diminished, and ceased completely in three days." "I have performed similar cures with *Aconite*." (Hempel.)

Other remedies may be indicated.

RANULA.

Ranula is a cystic tumor found underneath the tongue. It is a disease not often found mentioned in works on the diseases of infants. This swelling seldom occurs in new-born infants; it is of various sizes, shapes and qualities, and is situated on one side, or both, of the frenum. It either contains a limpid, or else a thick, albuminous fluid, or

hard, sandy, even stony concretions, containing a clayey substance, stearic acid, ammoniac osmazone, fibrin, phosphate of lime, mucus, etc. Whether it is in many instances due to an inflammation of the bursa mucosa, that ranula owes its origin, it is difficult to decide, but it is the opinion that a scrofulous(?) diathesis is the primary cause of this disease, and that it is perhaps complicated with a syphilitic taint. This, however, is a speculative notion of Hartmann's, which he derives from the fact that the principal remedies for those diseases are likewise the principal remedies for ranula. There are now three kinds of ranula recognized: First, a cyst formed by dilatation of Wharton's duct. Second, a dilatation of a sublingual duct, which also forms a cyst. Third, the dilatation of a mucous follicle. Fourth, a cyst formed by the dilatation of a bursa mucosa.

The first two kinds are often associated with a salivary calculus, which should receive the appropriate treatment called for in these cases. The third variety is filled with a putty-like substance, consisting of epithelial cells, filled with a granular fat, while the fourth contains a clear fluid. When the latter occurs, there is a small tumor at the root of the tongue, on either side, presenting a semi-transparent, jelly-like, bluish appearance, attaining sometimes the size of a small walnut. It is not painful, is quite soft, having no hardness or concretion anywhere, and evenly covered by mucous membrane; the movements of the tongue, when it is large, are impeded, and the speech is consequently thick. There may also be swelling of the cervical or other glands in the same patient.

Treatment.—In some cases it ruptures and disappears spontaneously, or it may be necessary to puncture the cyst and let out part of the contents, especially if the tumor grows very fast, or is very large, but this is only of temporary benefit. *Calcarea carb.*, *Mercurius* and *Thuja* have been employed with success in the treatment of this morbid growth. *Calcarea* is not precisely indicated by the symptoms, for among the symptoms of *Calcarea* there is not one that points to ranula; not even the tongue symptoms justify the selection of this drug. But then we know that *Calcarea* has cured swellings resembling ranula, such as hygromacysts, and that its action on the lymphatic system, and anti-syphilitic virtues, are very great. The simplest process of inductive reasoning leads us to suspect that *Calcarea* might therefore be useful in ranula. We can surely not expect that the provers of our drugs will continue a proving until an actual disorganization shall have made its appearance. This would be unnecessary.

As regards the *Mercurius sol.*, it is Hartman's impression that it will not cure ranula, unless his belief that the ranula is a more or less syphilitic growth should be correct. The tongue symptoms of *Mercurius* indicate a morbid condition of the substance of the tongue, of the sublingual and mucous glands, but without concretions. The ranula said to be cured with *Mercurius* was probably not a genuine ranula; it was not transparent but fleshy, of a reddish color; it may, however, have had all the secondary symptoms which belong to the true ranula. If *Mercurius* be the remedy, there will always be an increased secretion of saliva, arising from a swelling and disorganization of the Whartonian duct.

The ranula which has been cured with *Thuja* is said to have been transparent, of a blue, red and gray color, and of the consistence of jelly. There was generally a syphilitic, condylomatous taint, and at certain times of the day, and during rest, and in the warmth, painful prickings were experienced in the swelling. In no other way can the use of *Thuja* in ranula be accounted for. This shows that a merely routine knowledge of our drugs is not sufficient to become a good practitioner. Cases that have been cured with this remedy, (*Thuja*), are reported by Dr. J. G. Blake, (*Monthly Homœopathic Review*, vol. xiii, page 583—Noak and Trinks, *Hauptman, A. H. Z.*, xxix, page 276; Oehme, page 214; Ruckert, *Klin Erfahr*, vol. i, page 500.)

Jahr recommends *Ambra* as a remedy for ranula. Hartmann thinks that *Natrum muriaticum* deserves a preference over *Ambra*, especially in relapses, and when after the puncture and emptying the tumor, the above remedies are not sufficient to effect a cure, *Sulphur* is to be recommended, especially when it suits the disposition of the patient, and the particular cause of the disease. Dr. Gilchrist (Surgical Diseases, p. 87,) adds *Ambra grisea*.

In his "Forty Years' Practice," Jahr says, "So far I have cured most cases of ranula with *Mercurius*; only in one case, where *Merc.* seemed unable to effect a cure, I have had to complete it with *Thuja*, and in another case where *Thuja* had effected the beginning of an improvement, I had to wind up the treatment with *Nitric acid* and *Mercurius*." This fact should be impressed, viz.: That ranula is evidently the local manifestation of a general condition, as this is doubtless due to a chronic inflammation of the ductus Whartoni closing the outlet, *Mercurius* has been successful, and doubtless is the chief Homœopathic remedy.

The surgical treatment, (Allopathic) consists in removing the ante-

rior part of the cyst, and frequently repeated cauterization of the opened cavity with a solid stick of *Nitrate of Silver*. A simple incision into the cyst, and evacuation of its contents, does not answer, because the cyst is very prone to close up again; this is still more promoted by pressure of the overlying tongue. A very torpid ulcer results from the cavity that is thus exposed, which does not close up until it has been repeatedly and intensely cauterized. (Vogel.)

ATROPHY OF THE SALIVARY GLANDS.

There are cases where these glands are all unnaturally small. This is doubtless the case in children whose faces are narrow, especially at the angle of the jaws. Their size has doubtless much to do in the development of the lower part of the face. If large, they will add to the breadth; if small, the jaws will appear narrow. Their atrophy will have a marked effect upon the nutrition of the child, as the acid elements will be in the ascendancy, and the digestion of starch will be much interfered with. Such a child will need much albuminous food to thrive well, and we need not expect it to be fleshy unless we can coax the glands, by a liquid diet, to take on greater functional activity.

INDURATION OF THE SUBLINGUAL GLANDS.

These glands, about the size of an almond, are situated just beneath the tongue in the symphysis of the jaw, and have eight to twenty excretory ducts that open on each side of the frenum, two open into Wharton's ducts, the outlet of the submaxillary glands.

Induration of these glands may be detected as a hard body just back of the symphysis of the jaw, about the size of a pigeon's egg. If both are swollen there will be two hard bodies felt. Usually only one becomes indurated. Sometimes it is very painful, and the swelling goes on to suppuration. It may discharge into the mouth, or break externally.

Treatment.—As the disease rarely arises idiopathically, the remedy will need to be determined by the general condition of the system. When the induration arises idiopathically, it may exist for years without being noticed by any one. In these cases it will need about the same remedy as induration of the other salivary glands.

INDURATION OF THE SUBMAXILLARY GLANDS.

These glands are situated near the angle of the jaw, under the tongue, and upon the muscles at the root of the tongue. They weigh about

two drachms each. Their duct, (Wharton's), is about two inches in length, passing upward and forward, opens on each side of the frænum, among the ducts of the sublingual glands. Ranula, as we have seen, is sometimes due to occlusion of the duct of Wharton.

Induration of this gland is revealed by a node at the angle of the jaw. Sometimes the gland on only one side is affected. There is felt a hard body beneath the tongue, which interferes with the contraction of its muscles, and therefore its normal action. At times there is marked pain. Extensive hypertrophy of this gland may exist without great inconvenience, except a thickness of speech. This condition of this gland cannot be present without a very marked derangement of nutrition. The gland may be sympathetically as well as idiopathically affected.

Treatment.—For the remedies, see Parotitis. If there is a profusion of saliva, starchy food, as bread, crackers, etc., should be eaten freely.

HYPERTROPHY OF PAROTID GLAND.

The parotids, so named because near the ear, are the largest of the group of salivary glands, and the ones most frequently affected. Hypertrophy of the parotid may be either of a benign or of a malignant character.

The benign form originates slowly, and may be either fibroid, adipose, or cystic tumors. Simple hypertrophies are always (Vogel) unilateral, and although large, the jaw is always moveable. The lobe of the ear is pushed off, which distinguishes it from induration of the cervical lymphatics. There is little or no pain on pressure. Malignant hypertrophy consists of a medullary or fibroid carcinoma. As it is dependent upon carcinoma elsewhere, and is very rare in children, the diagnosis is comparatively easy. Tuberculous infiltration scarcely ever occurs in this gland.

The treatment of simple hypertrophy will be about the same as in parotitis. The old plan was to paint them with *Ioaine*, or excise them, especially in cancer; but the true scientific method will be to select the exact similimum. In these cases, *Lapis albus* should not be forgotten. *Conium*, *Carb. an.* and *reg.*, and *Arsenicum*, should be compared. Articles of food that stimulate the secretion of saliva should be avoided in carcinoma as tending to increase the hypertrophy.

PAROTITIS, SECONDARY AND METASTATIC.

(1.) Secondary parotitis may arise from mercurialization, diphtheria, or ulcerative stomatitis. In these cases the swelling and pain are

slight. The lymphatics are usually also involved, rendering the diagnosis somewhat difficult. The history of the case, and the cause of the trouble, will decide.

(2.) Metastatic parotitis makes its appearance during the climax of scarlet fever, typhoid, measles, variola, etc. The earlier this complication occurs, the more the danger. If it appears late, it may retard, but not prevent recovery, although its evident pyæmic character should not be forgotten. At times, it is doubtless due to mechanical occlusion of Steno's duct, as a consequence of the dryness of the parts.

The treatment should be directed to the general disease in the first instance; while, in the second, Steno's duct should be opened if closed, and resolution or suppuration hastened by warm fomentations, and such remedies as aid these processes when administered, viz.: *Hepar, Mercurius, Silicea, Apis, Arsenicum, Pulsatilla, Rhus, etc.*

PAROTITIS EPIDEMICA. (MUMPS.)

This is a strange epidemic disease among children. The character of the disease is generally modified by the type that happens to prevail at that time, so that the medicine which had been found to act as a specific remedy in one epidemic, may not be of much use in the next. The following is from Hartmann, with additions.

The disease is generally ushered in by such symptoms as alternate chills and heat, frequent pulse, general feeling of illness, languor, pains in the limbs, sleeplessness, restlessness, loss of appetite, etc. After the lapse of some three or four days, the local affection shows itself. In the region of both parotids a swelling of tolerable size becomes visible; it is slightly red, tense, frequently œdematosus, and may spread upward beyond the cheeks and eyelids, and downward as far as the chest, distorting the face to such an extent that it is impossible to recognize its former shape; the submaxillary and sublingua glands, and even the inner mouth, are frequently swollen; the patient is unable to open the jaws, mastication and deglutition are impeded. As the swelling develops itself, the fever generally abates. This is the simple form of the disease, which generally terminates after the lapse of seven days, in a gradual decrease of the swelling, or by the breaking out of a sweat, by a flow of saliva, discharges of blood, urine or stool. In some cases the swelling suddenly collapses, the fever reappears, and other organs, such as the brain, lungs, stomach, pancreas, scrotum, mammae, etc., swell. Suppuration and induration are rare terminations of the disease. The disease may terminate

fatally by metastasis, pressure of the swelling upon the cervical vessels, and by suppuration.

The symptoms which characterize this disease, vary. The fever, for instance, is sometimes wanting from the beginning to the end of the disease ; it may be a simple erythema, or else a synochia, and may be accompanied by delirium, convulsions, and violent vomiting. At other times, the eruptive fever is intense, and the swelling inconsiderable, whereas the reverse may likewise happen. The fever is generally characterized by distinct remissions and exacerbations. In some cases the patients feel sick for weeks before the disease breaks out, whereas in other cases the swelling commences on the very first day. The swelling varies likewise ; in most cases it commences on one side, and then speedily attacks the other ; but there are cases where a long period elapses before the other side is invaded. The swelling has scarcely ever a phlegmonous character, it is not very tense, frequently doughy, the skin covering the swelling is pale, or not very red, nor is the temperature much raised ; there is not much pain ; at other times the swelling is oedematous, and looks livid, (a bad symptom). Metastasis to the brain is dangerous, unless the original swelling should suddenly reappear, as is sometimes the case. The termination in suppuration is very rare, and takes place only when the inflammation has a phlegmonous character, as during epidemic scarlatina, in which case an ichorous pus is secreted. Post-mortem examinations have shown that the gland may become infiltrated with pus, or that the pus may collect in the surrounding cellular tissue. In some cases the abscess opens into the meatus auditorius, and a discharge of pus from the ear takes place. Induration is likewise a rare termination, and if it do take place, it is in gross, so-called scrofulous, subjects. Other terminations are : Anasarca, emphysema, gangrene. Sequelæ : Hard hearing, buzzing in the ears, deafness, etc.

Causes.—The disease is generally epidemic ; it has appeared as the precursor of epidemic croup, or in company with catarrh, measles, scarlatina, small-pox, or erysipelatous inflammations ; as an endemic disease it is probably known only in damp, foggy regions, near the coast, as in Holland, England and France. The disease prevails in the spring and fall, and is then apt to break out in children who take cold or get wet. The disease rarely occurs before the second year, and but once in a lifetime, unless it affects only one side. According to some, the disease is particularly contagious when desquamation takes place.

Prognosis.—This disease is easily cured, and is generally without any danger. There is danger of metastasis when the swelling suddenly decreases, and the fever increases at the same time; metastasis to the brain and lungs is very unfavorable. Some seasons there is a great tendency to suppuration, which is a serious complication.

Treatment.—Like many other epidemic and exanthematic diseases, parotitis, if left to itself, runs a natural course until resolution takes place. The intensity and character of the accompanying fever depend upon the prevailing type of the disease, which determines more or less the choice of a remedy. We know of no prophylaxis at present. Hartmann's treatment is as follows: It is impossible to indicate, and it would be superfluous to give, medicines for the precursory symptoms; all that a Homœopathic physician can and should do, is to treat the disease after it has fully developed itself. Among the remedies for mumps, we distinguish in the first place:

Mercurius solubilis.—In the beginning of Homœopathy this was the sovereign remedy for mumps, and with it we cured almost every case, or rather, we gave one dose of *Mercurius*, and then waited until the disease had entirely disappeared. Since then, experience has shown that *Mercurius* is really a specific remedy for this disease, provided it is rightly administered. The most suitable attenuation is the 6th to the 12th, one dose every four hours, and less frequently on the second day. It is indicated by the following symptoms: The disease was caused by a cold; erethic fever, alternate heat and chills, in frequent paroxysms, with nightly thirst, and a striking disposition to night-sweats; the local symptoms, swelling, etc., have been described above, and may be very slight or else very much developed; the appetite is entirely gone, which might, however, be owing to the fact that the jaws cannot well be opened, and that deglutition is difficult, especially for dry food. Ruddock thinks *Merc. iod.* the best form for children predisposed to glandular troubles.

If *Mercurius* should remain without effect, or if the swelling should threaten to become hard, *Baryta carb.* 12th, will hasten the resolution; and if a remnant of the disease should then still exist, as a bluish or purplish swelling, with hoarseness and slow fever, a small dose of *Carbo vegetabilis* 30, or, if excessively hard, *Conium* 30 will remove it. *Coccus lus* is very useful in these cases.

For phlegmonous inflammation of the parotid glands, with red face and eyes, the best remedy is *Belladonna* 24 or 30, a small dose every three hours. The swelling is red, shining, or running in rays from the

centre, and very sensitive, stitches strike through it, the heat is intense, both internally and externally, worse in the afternoon and on the right side, and the collateral symptoms indicate a typhoid condition, e. g., lethargy and delirium. To prevent suppuration, which is very apt to set in, it is necessary to repeat the *Belladonna* pretty often, until the disease seems to be arrested. Sudden disappearance of the tumor, with pain in the head, and with unconsciousness and delirium, indicates *Belladonna*. In similar cases, when the pain in the head is very acute, worse from the least motion, *Bryonia*. If no relief follows *Belladonna* in thirty-six hours, give *Hyoscyamus*, especially if there is constriction of the throat, with difficulty of swallowing, loss of speech, staring and distorted eyes. (Williamson.) If typhus should actually supervene, and *Belladonna* should be without avail, *Rhus tox.* 12 will most probably effect a cure. It frequently happens that phlegmonous parotitis develops itself during epidemic scarlatina, sometimes as a vicarious symptom; in such a case *Belladonna* is certainly indicated, and would only yield the palm to *Rhus tox.* in case the inflammation should assume an erysipelatous character, with nightly restlessness. For parotitis after scarlatina, especially when accompanied with dropsical symptoms, *Rhus tox.* is a specific remedy. (Hartmann.)

Lachesis.—If the swelling commences on the left side, and afterward affects the right gland.

Lycopodium.—Commences on the right side and goes to the left.

Hepar, *Silicea*, *Arsenicum*, *Sulphur*, or *Rhus*, may be also required where suppuration takes place. (Guernsey.)

Coccus will be indicated if there is much faintness, with spasms in the stomach, either during or following mumps. If there is digging pain in the lower jaw; dryness of the throat and mouth, with lacerating pain in the swollen gland. (Williamson.)

Parotitis arising from bruises, or contusions, requires to be treated with *Arnica* 6, and if the disease should assume a chronic form, with excessive hardness, *Conium*.

Metastatic changes have to be warded off by quiet and a uniform temperature, and hot applications to the glands. If this should actually have occurred, the metastatic disease will have to be treated in the same way as the primary forms of the disease.

Pulsatilla.—If metastasis to the mammae or testicles takes place. *Nux* or *Mercurius* may also be suitable for this condition in some cases. Gilchrist suggests *Aurum met.* where the scrotum is swollen hard, red and shining, hot, and covered with white scales. Left side.

The child should be kept quiet, protected from cold, damp, and excitement. The food should be mainly liquid.

INFLAMMATORY DISEASES OF THE MOUTH.

CONGESTION, SIMPLE INFLAMMATION, THRUSH, APHTHÆ, ULCERATION AND GANGRENE.

Teste says: "The intestinal exanthemata, if I may so speak, are perhaps as numerous as the cutaneous exanthemata." This is certainly true of the upper or cephalic portion. Meigs and Pepper truly remark that there is considerable embarrassment as to what classification of the diseases (inflammatory) of the mouth is the most proper to adopt, on account of the confusion that reigns among authors as to the nature of these affections, and consequently to their nomenclature. It is very difficult to reconcile the various discrepancies which exist. The following arrangement is the one best suited to the present knowledge of these disorders: 1. Passive congestion. 2. Simple or erythematous stomatitis. 3. Thrush, muguet or catarrhal stomatitis with curd-like exudation. 4. Aphthæ or follicular stomatitis. 5. Ulcerative stomatitis. 6. Noma, cankrom, oris, gangrene of mouth.

The physiology of the mucous membrane of the mouth should be glanced at that we may better comprehend the pathology that may be encountered. In the mouth we have a mixture of two glandular secretions, namely, the secretion of the salivary glands and of the mucous follicles. Pure salivary glandular secretion always reacts alkaline, and, indeed, most distinctly so, immediately after a meal. The secretion of the mucous follicles soon becomes sour. In early infancy there is little or no saliva and the mucus frequently reacts acid. The acid reaction is always more distinct when fresh mucus is allowed to stand, for, owing to the fermentation that takes place, pure acid is rapidly generated. We have, then, two diametrically opposite reacting fluids in the mouth, and it will depend upon their quantitative relation to each other, and their degree of concentration, whether the mixture should possess more of the properties of saliva or of mucus. If a sufficient quantity of alkaline saliva is present, the free acid developing in the mucus is thereby neutralized; if not, a distinctly acid-reacting secretion of the mouth originates (Vogel) and stomatitis is the result.

CONGESTION.

Passive congestion of the mucous membrane of the mouth are rare during the intra-uterine life; yet Billard once saw in an infant just born, an ecchymosis at the base of the tongue; it was of a violet color, and spread from the base to the middle part of the organ; it penetrated to the depth of three lines. The tissue of the tongue was very much softened at this place.

It is very common to meet, at birth, with instances in which the buccal membrane is the seat of a well marked congestion. This congestion, and the redness arising from it, disappear by degrees after birth; but certain portions may remain, for some weeks, the seat of red patches, which however are gradually effaced. An ecchymosis of greater or less extent, is often seen continuing for a long time in the palatine arch.

Treatment.—Congestion should not be neglected, for with the acidity of the buccal secretions, thrush or more serious trouble may result. If any treatment is necessary for congestion a dose of *Belladonna* will usually prove sufficient.

STOMATITIS.

Inflammations of the mouth are in most of the recent works on diseases of children distinguished by the term *stomatitis*. Stomatitis is from the Greek *Stoma*, a mouth, and *itīs*, bold rash. Stomach is also from the same word, but if we remember that the word *gastritis*, which means a mouth or any outlet or entrance, is applied to the stomach, no confusion of terms need occur.

It is impossible to convey, by a general description, a proper knowledge of stomatitis because every part which enters into the composition of the parieties of the mouth, may become the special seat of the varieties of inflammations which are developed in this cavity. The disease then takes a peculiar aspect and gives rise to symptoms which are proper to it.

SIMPLE OR ERYTHEMATOUS STOMATITIS.

This form of *stomatitis* consists of simple diffuse inflammation of the mucous membrane of the mouth, unattended by vesicular or pustular productions, by ulcerations, or by membranous exudation. The congestive state in which the oral mucous membrane always exists in the new-born, disposes it to become the seat of erythema. It occurs usually, however, before the completion of dentition, and it is most frequent under the age of one year, giving rise in itself to no severe

symptoms and often being connected with other grave and dangerous affections, is doubtless in many cases overlooked. (Smith.)

Some authors as Condie, Evanson, Billard, Steiner, Marshall, Churchill, Jacobi, Smith, say it is of frequent occurrence, while others state, with Meigs and Pepper, that it is of infrequent occurrence, except in the forming stage of other kinds of stomatitis, and of little importance, seldom requiring the attention of a physician.

The *causes* of the diseases are the introduction of irritating substances, such as hot drinks, and acrid or caustic preparations, into the mouth, also from the use of certain drugs, such as, *Mercurius*, *Iodine*, *Antimony* and *Arsenicum*. (Steiner.)

It is further seen under the influence of many dyscrasiae and the processes of difficult dentition. Jacobi on Dentition takes exception to laying so much blame to difficult or prolonged dentition in producing stomatitis. He cites injuries, bad diet, sucking bags, alcoholic beverages, coffee or stimulants of whatever which act as irritants, producing hyperæmia or inflammation of a more or less severe form. There are also a number of indirect influences, as probably sympathy with disordered states of the stomach. It occurs not unfrequently as a secondary affection, particularly in the course of measles, scarlet fever, smallpox, syphilis and typhoid fever and Bright's disease. Cases frequently occur in the autumn months and are due to cold and general derangement of the system.

The *symptoms* of erythematous stomatitis are more or less vivid redness of the mucous membrane, which is sometimes diffused, and sometimes punctuated or disposed in patches; slight swelling of the same tissue; heat, and tenderness to touch, and in the act of sucking or eating the temperature of the mouth is perceptibly raised. The child is generally fretful and restless, and either loses its appetite, or refuses to nurse or take food freely, on account of the tenderness of the mouth. There are seldom any general symptoms except in secondary cases, in which they are those of the primary affection.

The *course* of this disease varies. It may either be transitory or continue for a length of time. In the former instance the inflammation is slight and confined to one part of the mouth, while in the latter it occupies the entire cavity and may spread to the lips, which may tumefy, excoriate, crack, and become the seat of herpes labialis. When the inflammation is of long duration, it may produce an abundant ptyalism, particularly in infants from seven to nine months old. (Billard.)

Jacobi asserts that it is frequently of long duration and obstinacy, as its causes will often continue or return or be replaced by others, and very generally proves a serious difficulty, although unattended by severe fever or deep seated anatomical disorganization of any particular organ.

The anatomical changes in simple erythema consist of alterations of the color of the mucous membrane to a dark red, sometimes limited to isolated and circumscribed spots, and in other cases extending over large surfaces or uniformly over the whole membrane which is then swollen and dry, the papillæ of the tongue, enlarged and injected, its epithelium abraded, and the mucous glands of the lips and cheeks project as whitish-grey, yellowish or transparent nodules and yielding on pressure a drop of mucus. Along with the swollen mucous glands, there are sometimes seen small vesicular patches, resembling herpes, which soon dry up, and leave scales behind them. The epithelium of the tongue is abundantly shed, and the oral secretion is increased in quantity, is of acid reaction, sometimes thin, sometimes viscid and flocculent, and seems to produce excoriations at the angles of the mouth and on the chin when it runs over.

Treatment.—Dr. S. P. Hedges attending physician of Chicago Half-Orphan Asylum, says: “In cases of simple inflammation of the mouth, *Aconite*, *Merc. viv.* 6x with weak solution of *Kali chlor.* as a wash is generally sufficient.”

While writing up this disease I was called upon to treat several cases. There was a diffuse redness, especially of the mucous membrane of the palatine portion of the mouth and the tip of the tongue. The appearance was as if scalded. There was a profuse flow of saliva, the tongue was flabby, and the aggravation was in the evening, all of which symptoms pointed to *Mercurius*. The remedy speedily cured all the cases. Other remedies may be indicated, as *Arsenicum*, *Nitric acid*, *Kreosote*, etc. (See the other forms of stomatitis.)

THRUSH—MUGUET—STOMATITIS PAPULOSUM.

This is a peculiar form of inflammation of the mouth, with which there are points or patches of a curd-like exudation on the inflamed surface.

Synonyms.—Thrush, muguet, sprue, soor, parasitic aphthæ, stomatomykosis, (mehlmund), blanchet, stomatitis cremosa, aphthophyta, mucosity.

Historical.—This common disease of infancy has been confounded with aphthæ by many authors and pathologists. It is described under

the head of aphthæ or thrush by Underwood, Eberle, Leadam, Williamson, Ruddock, Hartmann, Teste, and Guernsey; of aphthæ by Dewees; erythematic stomatitis, with curd-like exudation, by Condie; of muguet, by Billard, Bedford, and French writers generally; of pseudo-membranous stomatitis, by Churchill, Gardien, Valleix, Troussseau, Underwood, Guersant, Lelut; of parasitic aphthæ, by Steiner; of aphthæ lactantium, by Boerhaave, Van Sweiten, Bateman; of aphthæ lactamen, by Sauvages; of aphthæ infantalis, by Pleuck.

The "thrush," adopted by most recent authors, is of uncertain etymology, as is that of its Swedish synonym, "*Torsk*," and the Danish and Norwegian "*Trodske*." This disease was regarded by the ancient authors as a simple or gangrenous ulceration of the digestive mucous membrane. Later authors have described it to us as a papular or vesicular eruption, of the nature of aphthæ. Another opinion was put forth in which thrush was regarded as an inflammation with pseudo-membranous exudation, analogous to that of coryza, or diphtheritis. (Bouchut.)

This is the earliest disease of the mouth in infancy—the babies' sore mouth. The usual seat of thrush is the mucous membrane of the mouth, but occasionally it affects the fauces, pharynx and œsophagus. It is rare in the sub-diaphragmatic portion of the digestive tube, but a few such cases have been reported by Billard and others. It never affects the respiratory mucous membrane, (nostrils, larynx, or bronchial tubes,) and very seldom occurs in any other part of the alimentary canal without also being present in the mouth. Thrush, then, is a stomatitis, pharyngitis, or œsophagitis, or a gastro-enteritis, with the additional element described.

Anatomical characters.—The first stage of thrush is that of simple inflammation of the mucous surface. There next appear minute semi-transparent points or grains, which, increasing, soon become white and opaque. Some of them remain as points, while others, extending, and, perhaps, coalescing with those adjoining, form patches of greater or less extent. The white points or patches are unequally elevated. Their central part, which was first formed, is most raised, while their circumference projects but little above the epithelium. Their highest elevation is not ordinarily more than a line above the surface. They are smaller in the pharynx and œsophagus than when occurring upon the buccal surface. They resemble closely, in color and consistence, portions of curdled milk, and the nurse often mistakes them for such, and neglects to call attention to the state of the mouth. They are

readily detached by a little force, but are speedily reproduced. The color is first white, and sometimes this color continues. In other cases they assume, if the disease is protracted, a yellow hue.

Thrush fungus, (*Oidium albicans*, Robin,) Wagner, (Pathology, p. 99.) describes it as "consisting of cylindrical, branched, curved, strongly refracting, sometimes branched (tree-shaped) filaments, which are composed of long cells connected together, between which constrictions are often found. Each of the long cells contains many granules. The ends of the filaments are lost in masses of spores, with a large, often divided spore cell. According to Bouchardt, (*Char. Ann.* xii, p. 1,) the fruit capsules of the thrush fungus present round or oval, sometimes double contour capsules, .02 to .083 mm. in size, which are entirely filled with spores, and burst very easily. He could not discover connection between the capsules and filaments. In opposition to Winckel, (p. 93,) and in accordance with Hausmann, (Berl. Med. Ctrbl, 1869), the fungus occurring on the female genitals is identical with *Oidium albicans*. It is, like the latter, transmissible. Also the pure thrush fungus of the mouth is transmissible to the vaginal mucous membrane. Sowings with *penicillium glaucum*, *asperg. glaucum*, the fungus of *pityriasis versicolor* were attended with negative results. The free end is simple, rounded, or terminates in one or several large oval spores, connected together. The latter are rounded or oval, often united to one another, contain granules, and constitute large masses upon the epithelium. It is often found, and sometimes in very large masses in nursing children, especially within the first few weeks of life, as well as in adults affected with wasting diseases, (typhoid fever, tuberculosis, etc.,); upon the mucous membrane of the mouth and throat, seldom upon that of the cesophagus, nose, large air passages, lungs; seldom upon the labia, breast and lips of infants. It occurs in infants, especially through the want of cleanliness, attention to nursing bottles, and in warm weather."

Furred Tongue Fungus and Thrush Fungus Compared.—On this point; Frey (Microscopic Technology, p. 424), in describing the microscopic appearance of the *oidium albicans*, the thrush fungus, as compared with a gastric furred tongue, says: "In furred tongue the papilla *filliformis* is covered with a fine granular matter, which contains the filaments and fragments of the lower vegetable organism, from the order of the Schizomycetes, (Nageli) (the *Leptothrix buccalis* of Robin) which consists of a confused mass of extremely fine filaments. If we place a small portion of the *oidium albicans*, moistened with water,

under the microscope, we see much broader, jointed, fungus filaments, with spores and mycelium, so that it is impossible to confound them with the *leptothrix buccalis*, the filaments of which are so fine."

In two or three cases examined by Dr. J. L. Smith, the product of thrush removed from the œsophagus, the parasitic plant found was the *penicillium glaucum*, (mould), or a conferva closely resembling it.

This morbid product is in points or small patches, in the mildest form of thrush. If the patches are of large extent, especially if, as rarely happens, a considerable part of the buccal surface is covered by them, there is generally a state of great prostration and danger, from some antecedent or concomitant disease. Thrush is, indeed, often the sequel of some grave affection, as pneumonia or gastro-intestinal inflammation. Its complication with the last named disease is common in young, ill-fed infants, especially those deprived of the breast milk, and such cases are very apt to be fatal.

Physicians who have studied infantile diseases in foundling hospitals, regard thrush as one of the most serious affections of early life, which it certainly is. Valleix, in a book of seven hundred pages relating to diseases of children, devotes more than one-third to the consideration of muguet. Of twenty-four cases, the records of which he publishes, twenty-two died. The disease of which these infants died, was gastro-intestinal inflammation, which the author considered a part of the more general disease, muguet. Doubtless the same cause which produced the stomatitis, with the confervoid growth in these infants, also produced the fatal gastritis or gastro-enteritis, occurring without this growth. It is better to restrict the term sprue, thrush, or muguet, to the inflammation of that portion of the mucous surface which is the seat of the parasitic growth. Most authors now reject, from their description of the anatomical characters of thrush, those sub-diaphragmatic inflammations which some writers consider an important part of this disease. When the fatal gastric or intestinal inflammation is accompanied by the characteristic vegetable growth on the gastric or intestinal surface, it is proper then to say that death occurred from thrush. This explanation seems necessary in order to understand the different statements of writers, in relation not only to the anatomical characters of thrush, but also in reference to its mortality.

The frequent coexistence of thrush with gastro-intestinal inflammation has been remarked in the hospitals of both Europe and America. Post mortem examinations have frequently revealed evidences of inflammation in every division of the alimentary canal. The confer-

void growth is, however, seldom found below the fauces, and never below the oesophagus. It is never found in the air passages, which proves that it is not diphtheritic in nature.

Symptoms.—The first symptom of impending idiopathic thrush, so far as we are able to discover in the Chicago Foundlings' Home, has been an unusual drowsiness, due without doubt, to the preponderance of acidity, and therefore of venous blood. This acidity of the alimentary tract has also been noticed, in some cases, by an erythema about the thighs, as recorded by M. Valleix, in the infirmary of the Hospice des Infans Trouves. (*Clinique des Mal. des Infans*, p. 209.) This erythema preceded the thrush several days. Then the restlessness of the infant, and the difficulty it seemed to labor under in feeding, or the watchfulness of the nurse, directs attention to the sore mouth.

The mucous membrane of the mouth is often somewhat red, dry and tender, for a longer or shorter time (generally from one to three days) before the appearance of the exudation, and at the same time the papillæ of the tongue swell and become protuberant, especially at the margins. Next, the exudation shows itself in the form of small, whitish points, sometimes on the tongue first, and in other cases on the insides of the lips, whence it extends to the cheeks in idiopathic, mild cases, and to the roof of the mouth, soft palate, pharynx and oesophagus in the grave form. The points of false membrane first deposited rapidly increase in size and thickness, so that in from one to three or four days, they assume the form of large patches, or a continuous membrane, which covers the whole, or a considerable portion of the cavity of the mouth. When the exudation is recent, it is thin, and its surface smooth; when, on the contrary, it has been longer deposited, it becomes thicker, and its surface is rough.

The symptoms in thrush are not different, in most cases, from those of simple inflammation. In the mildest cases they are chiefly of a local nature, such as have been already described in our remarks on simple stomatitis. If the inflammation is more extensive, especially if it affect the fauces and oesophagus, the infant becomes feverish and fretful, and the inflamed surface is hot, red, and tender. On this point, Seguin, (*Medical Thermometry*, p. 174.) says, "the central temperature is inferior to the local, often by $.5^{\circ}$, and averages in the axilla 100° , in the mouth 100.5° , with this concordance between temperature 100° , pulse 108, and respiration 40. In thrush the central temperature of seven children, (Rogers' observations), is not proportionate to the extent of the exudation, average 100.13° when not brought lower by

the complication of sclerema, diarrhoea, or inanition. These compound temperatures are sometimes difficult to read aright. Squire, reporting mainly from city practice, found some higher temperature. (Thrush, minimum 95°, maxima 102°)."

In the worst forms of thrush the surface not only presents the ordinary features of severe inflammation, namely, heat, redness and tenderness, but it is sometimes deficient in the natural secretion, so as to present a dry or parched appearance. It is in these cases that there is often a more extensive inflammation than that of the buccal or cesophageal membrane. The intestinal tube is inflamed. The infant, in these severe cases, has thirst, loss of appetite, restlessness, vomiting and frequently diarrhoea. The countenance is anxious and pale; there is rapid emaciation, and, if the disease is not arrested, a state of extreme prostration soon occurs. The twenty-four severe cases related by Valleix, were examples of this severe form.

The Causes given by Vogel, of Dorpat, Russia, are : (1.) "The preponderating acid reaction in the mouth, which, in the new-born, is due to a faulty, (deficient), salivary secretion. The quantity of acid mucus outweighs the alkaline saliva, and then the mixture reacts acid.

(2.) "The transportation from one child to another, particularly through one and the same wet-nurse in foundling houses.

(3.) "The almost unexceptionally fermenting substances of the sucking rag, which is sometimes allowed to lie about upon all the dirty tables and places, and afterwards is thrust into the mouth of the infant." When we take into consideration the fact, that in Russia, it is a common thing to cut off a dead cow's teat and attach it to a horn with which to feed an infant, we can comprehend the force of the third cause given by Vogel. The child is very prone to thrush during the existence of stomatitis materna. (Hall.)

Thrush is most apt to occur in those who are constitutionally feeble, whose mucous membrane is only partially developed, or who are enfeebled by disease, or by unfavorable hygienic conditions. Cachexia is a cause common to thrush, and most other subacute inflammations of the alimentary canal. The most obvious and common of the unfavorable hygienic conditions alluded to, is the continual use of indigestible and improper food. It is, therefore, a common disease among foundlings, where they not only breathe an atmosphere which is often impure, but are deprived of the mother's milk, and are necessarily given a diet which is a poor substitute for it. Among the poor of cities, thrush is common, with whom, from necessity or choice, there

is the greatest neglect of sanitary requirements. Exposure to humidity, to variations in temperature, increases the liability to the disease, though in less degree than defective alimentation. Billard and Villeix agree that thrush is more frequent in the warm months than in the cold, that its maximum frequency is in the months of July, August and September. This is as true in America as in France. Various writers have mentioned the age at which thrush is most apt to occur, as one of the predisposing causes. Thrush is not common above the age of six months, and a majority of the cases occur under the age of three months. Infants of the age of one or two weeks, even if, in addition to lactation, they are spoon-fed by nurses, over-anxious that they should thrive, are apt to take the disease.

Diagnosis.—Thrush has been confounded with aphthæ by most Homœopathic authors, but the diagnosis is easy, so far as thrush in the mouth is concerned, for simple inspection by one familiar with the disease, is all that is required. Thrush in the alimentary canal, cannot be positively ascertained.

The vomiting, diarrhoea, pain or fretfulness, emaciation and rapid sinking, which sometimes accompany severe forms of thrush, indicate gastro-intestinal inflammation, to which the attention of the practitioner should be chiefly directed.

Aphthæ differ from it in their vesicular nature during the formative stage, in the ulcerations which follow the vesicles, and in the absence of false membrane. From ulcero-membranous stomatitis it may be distinguished by the formation, in that disease, of false membrane in layers from the beginning; by the presence of ulcerations; by the spongy, bleeding state of the gums; by the fetid breath, and by the absence of the abdominal symptoms which exist in thrush.

Prognosis.—The duration of thrush varies according to its intensity, and the favorable or unfavorable condition of the child. If it is slight, and the health of the infant otherwise good, it may often be cured in two or three days. Under other circumstances, it may continue as many weeks, or even longer, before it is entirely removed.

When thrush occurs in connection with gastro-enteritis, the mortality is very great. It has been already stated that in Valleix's twenty-four cases, twenty-two were fatal. M. Auvity estimates the mortality of such cases at nine in ten, and M. Godinat at two in three. Out of one hundred and forty cases which occurred in the Foundlings' Hospital, Paris, only twenty-nine recovered.

Treatment.—When thrush arises from a vicious alimentation, the

first thing to be done is to submit the child to a suitable regimen. If there is reason for attributing the disease to the scarcity or bad quality of the milk, this should be improved or supplemented, or the nurse should be changed. If, on the contrary, the child is fed with the sucking bottle, it will be easy to make the necessary modifications in its food. Teste advises the following: Take of beef and veal, each, three ounces; boil them six hours in a quart of water, add a little salt, skim when cold; mix this broth with equal parts of cow's milk and water, and warm it a little for use. Suppose we increase every day the quantity of meat in the broth, and of broth in the mixture, so that the milk shall finally disappear, and I venture to affirm that we have solved one of the most important questions in the hygiene of children." For further suggestions, see "Foods."

As Guernsey aptly remarks, in all cases, except the very mildest, thrush renders nursing a painful operation to the child; but as it usually appears in connection with, or in consequence of, serious derangements of the stomach and bowels, such as vomiting and diarrhoea, the proper remedy will be found among those indicated for such conditions. It should always be borne in mind, however, that if the child is kept constantly clean, and if it is not dressed too warmly, it will seldom or never be troubled with thrush.

Where the thrush is by itself, and is unattended as yet by other morbid symptoms, it may be removed, and the still deeper mischief to which it would lead, anticipated by giving *Calcarea*, *Chamomilla*, *Borax*, *Bryonia*, *Mercurius*, *Sulphuric acid*, *Arsenicum*, or *Muriatic acid*, according to the character of the accompanying conditions, and to the particular appearance of the infants mouth.

Teste says: "I do not know of anything in our Homœopathic literature which has direct reference to muguet. (Thrush.) Authors, in general, confound this affection with aphthæ, which does not demand precisely the same treatment. *Cinnabaris*, at a high dilution, and in mild and repeated doses, is perhaps of all the mercurial preparations, that which best corresponds to muguet of the mouth and œsophagus. *Mercurius solubilis* may also be administered in the same manner, and later, *China*, if there is reason to believe that the disease has invaded the stomach and intestines."

Leadam gives the following treatment:

"*Sulphuric acid* 3, two globules put in a wineglassful of water, a tea-spoonful to be given every three or four hours, or a globule may be placed on the tongue. *Muriatic acid*, 12, is likewise an excellent rem-

edy. *Mercurius virus*, 12, is also specific for this disease, and can be given in the same manner, especially when there is much saliva in the mouth. *Sulphur*, 30; two globules should be administered in the same way, if the disease has not disappeared in five or six days. *Borax*, 30, has sometimes succeeded, when the above-mentioned remedies have failed. *Bryonia*, *Nux vom.*, *Chamomilla* and *Arsenicum* are occasionally required."

Ruddock (p. 160.) gives the following directions for local treatment:

"*Borax*.—The mouth should be washed with a weak solution of *Borax*, (ten grains to one ounce of water), by means of a soft brush. Or *Borax* and *Glycerine* may be used, half a drachm of the former to one ounce of the latter. The infant will swallow sufficient for a dose each time the solution is used. Before using the *Borax*, the infant's mouth should be well cleansed with a piece of linen rag, squeezed out of warm water. *Borax* has a specific power over this affection, and if the disease is limited to the mouth, will cure it without the aid of any other remedy." If this is used, (I think it unnecessary,) the *Glycerine* should be diluted two-thirds, or the mouth should be well moistened with water. The rag is irritating and unnecessary.

"*Sulphurous acid* (one to five of water,) is a valuable remedy, applied by a spray producer, two or three minutes twice a day.

"*Sulphite of Soda*, (drachm to ounce of water,) applied in the mouth twice daily, destroys the parasite in a day or two.

"*Permanganate of Potassa* (*Kali permang.* three grains to water one ounce) may be used when the breath is fetid.

"*Vinegar*, (*Acetic acid*), *Carbolic acid*, etc., diluted with water, are also recommended to cleanse the affected surfaces.

"Emollient fluids, as linseed, borax and honey, slippery elm, etc., are grateful and useful.

"This method of treatment is chemical, crudely Homœopathic, or simply palliative, and should not therefore be depended upon alone. The diet as well as the remedy must be selected to suit the case."

In my experience in the Chicago Foundlings' Home, and in private practice, *Mercurius sol.* has been the remedy most frequently indicated and promptly efficient. For the emaciation and restlessness, following the acute attack, *Arsenicum* has been chiefly indicated. Thrush seriously interferes with assimilation, therefore prostration is very rapid. Other remedies may be indicated. (Consult *Aphthæ*, *Cancrum oris*, etc.)

In many cases, however, the treatment of thrush is of less importance than that of the disease which the thrush complicates. When this is relieved, and the general health improves, thrush is more easily and permanently cured than during the state of feebleness and ill-health.

APHTHÆ—FOLLICULAR STOMATITIS.

This is the genuine aphthæ. Billard was the first to call it follicular stomatitis. Others term it vesicular. In this form of stomatitis the inflammation is confined to the muciparous follicles of the mouth, or to them and the mucous membrane in their immediate neighborhood.

Goullon describes aphthæ as follows : It is connected with redness and increased secretion. The tongue looks as if it were covered with a thick layer of raspberry syrup. On longer duration, a white coat appears upon it. The children do not like to have any portion of the mouth touched. Mucus always flows down the corners of the mouth, exoriating them, reddening the chin and soiling the clothes. The mucus reacts acidly.

Anatomical Characters.— There appear in the mouth elevations, red, hard and tender, which continue to enlarge and soon become vesicular. They may now break, leaving an ulcerated surface, but if they continue entire they become purulent, and then their contents are discharged. From the commencement of the papule to the purulent transformation, the period is perhaps three or four days. The ulcer which occupies the site of the eruption is round, hard, painful, and with a vascular margin. The base has a white or grayish appearance. The reparative process soon commences, the ulcer presents a healthy appearance, its size is gradually diminished, and finally cicatrization occurs. The liquid with which the follicles are distended, in the first stages of the disease, is believed to be its natural secretion, somewhat modified by the inflammation.

The number of ulcerations is various. There are, in most cases, from six to eight to as many as twenty. They are ordinarily discrete, and one or two lines in diameter. The stages of the disease rapidly succeed each other, and the patient fully recovers in from six to eight days, but not always. In exceptional instances, the ulcers enlarge and become confluent, or one or more of them assume a gangrenous appearance. This indicates a faulty condition of the system, a vitiated state of the blood, due perhaps to some antecedent or concomitant disease. In these cases, the ulcerative stage is apt to be protracted and recovery doubtful.

The seat of follicular stomatitis is usually the internal surface of the lips and cheeks, the gums, tongue, and occasionally the roof of the mouth. It rarely affects the fauces. Occasionally this form of stomatitis is associated with more general inflammation of the buccal

cavity. The gums may then be swollen and tender, bleeding if rubbed or pressed.

Causes.—The causes are not fully ascertained. Follicular stomatitis has not usually, in my practice, occurred in so feeble a state of the system as has been present in ulcerous stomatitis. Billard says: "Aphthous ulcers are particularly to be seen in children very feeble, pale and of a lymphatic temperament. We do not look for the causes of aphthæ in the retention of the meconium, acidity of the milk, or in the predominance of acidity in the fluids of the child; we attach more importance to the consideration of the original predominance of the lymphatic system, or rather to the remarkable predominance which this system acquires under the influence of bad nutrition and vitiated air, which is respired in badly ventilated places in those who are crowded together with a number of sick children."

Barrier considers follicular stomatitis to be allied to those gastro-intestinal diseases which are attended by turgescence of the mucous follicles, and he mentions among the causes, habitual congestion of the buccal mucous membrane, and difficult dentition. In most cases, probably, the exciting cause is some derangement of the digestive organs, which may not be appreciable.

While simple stomatitis, and stomatitis papulosa, are most common under the age of six months, follicular stomatitis is rare at this age. It is most frequent during the age which corresponds with dentition, when there is also the most rapid development and greatest activity of the muciparous follicles.

Symptoms.—The constitutional symptoms, in a large proportion of cases of aphthæ are slight. In twelve children affected with this disease, Billard found the pulse from sixty to eighty per minute. The ulcers are painful, as is indicated by the cries of the child when they are pressed, and its fretfulness. Solid foods, and even drinks, unless bland and unirritating, are badly tolerated. The salivary secretion is also augmented. In those rare cases in which the ulcers become confluent, or gangrenous, the state of the patient is really serious. There is then, often, gastro-intestinal disease. The symptoms indicate prostration. The pulse is feeble, the countenance pallid, and the body and limbs become wasted.

The diagnosis is easy. The only disease with which it is liable to be confounded is ulcerous stomatitis. In the ulcerous form there is antecedent and accompanying stomatitis, affecting a considerable part, if not the entire buccal cavity, while in the follicular form the

inflammation is ordinarily confined to the immediate vicinity of the ulcers. The character of the ulcers serves also as a means of distinction. In ulcerous stomatitis there is great variety as to size and form, while in follicular stomatitis there is great uniformity in both these respects. The small, circular ulcers are characteristic of the follicular inflammation. Before the ulcerative stage, the vesicular eruption serves to distinguish this form of stomatitis from all other local diseases affecting the cavity of the mouth.

Prognosis.—Follicular stomatitis usually ends favorably; but if the ulcers become concrete or gangrenous, the health is seriously affected, and a more cautious prognosis should be expressed. The unhealthy appearance of the mouth, and the real danger, are often more due to the depressing effect of some concomitant disease than to stomatitis.

Treatment.—Jahr says: “For aphthæ, the chief remedy is *Merc.*, even if not only the buccal cavity, but the gastro-intestinal mucous membrane has been invaded. If the improvement initiated by *Mercurius*, ceases after five or six days, *Sulphur* will in such a case almost always afford relief; and if *Sulphur* is not sufficient, *Calcarea*. I have often seen excellent effects produced by *Borax* and *Sulphuric acid*, but they never equaled the effects of *Mercurius*, *Sulphur* and *Calcarea*. For the small aphthous ulcers, which not only trouble children during the period of dentition, but likewise adults, I have not only given with success *Staphysagria* and *Mercurius*, but very frequently, also, *Belladonna*, *Borax*, *Nitric acid*, and *Natrum muriaticum*. (Forty Years’ Practice, page 108.)

The special indications are well given by Guernsey, in his excellent work on Obstetrics. To those we have added others. Consult also the other forms of stomatitis.

Aethusa.—The aphthous condition causes great distress. Profuse salivation, or dryness of the mouth. Vomiting of milk, or of a substance resembling milk. Diarrhoea or constipation; sometimes undigested stools. Much crying, as if from colic.

Arsenicum.—When the aphthæ assumes a livid or bluish appearance, attended with diarrhoea and great weakness.

Baptisia.—A bloated, besotted expression of countenance. Profuse salivation. Offensive stools. The child can swallow nothing but fluids; even a small lump of thickened milk will occasion gagging.

Borax.—The child frequently lets go of the nipple, showing signs of pain in the mouth from nursing. It starts from sleep when the mother attempts to lay it down.

Bryonia.—The mouth is usually dry, with thirst; dry lips, rough and cracking; the child does not like to take hold of the breast, but when once its mouth is moistened, and it is fairly at work, it nurses well. Worse in hot weather, hot days. Better when quiet.

Carbo veg..—The mouth is very hot, the tongue is almost immovable, and a sanguineous saliva escapes occasionally. Gangrene of the mouth. Foul discharges.

Chamomilla.—When the child exhibits much uneasiness, and *must be carried* all the time.

Mercurius sol..—Much salivation, or more than usual moisture in the mouth. There is inflammation of the whole oral mucous membrane. Ulcers upon the gums.

Staphysagria.—When the aphthous patches seem to bleed easily, and the gums are spongy.

Sulphur.—The child does not take its usual long sleep; it wakens often. The general appearance of the child indicates *Sulphur*.

Sulphuric acid.—The mouth appears very painful, and the child is very weak. Ecchymosed spots form on the skin. As in nearly all these cases there are stomach and bowel symptoms, it is well to consult the indications furnished under the head of Disordered Dentition, Indigestion, Diarrhoea, etc.

Local Applications.—Pure molasses, applied by means of a piece of muslin or linen, or by the finger, constitutes the best (healing) linctum or wash where one seems to be needed. A lotion of *Borax* and honey is the local treatment recommended by Allopaths. Dr. Shipman commends its use. It is certainly Homœopathic, although somewhat crude; still where the follicular ulcers dot the mouth in great numbers, seriously interfering with nutrition, prompt palliative measures may be needed to get the child to eat. Nutrition must be secured by all means.

STOMACACE — ULCEROUS STOMATITIS.

Definition.—Ulcerative stomatitis is a form of sore mouth characterized by the secretion upon the mucous membrane of a plastic exudation in thick, yellowish, adherent patches, and by inflammation, erosion, or ulceration of the subjacent tissues.

Symptoms.—It is the same disease as the aphthæ gangrenosa, and Meigs believes the cancrum oris of Underwood; the ulceration of the mouth of Dewees and Eberle; the stomatite couenneuse, and the ulcerative and pseudo-membranous forms of the stomatite gangreneuse of M. Valleix; the stomatite pseudo-membraneuse, or diphtheratique, of

some writers; and the stomatite ulcero-membranous of Rilliet and Barthez. It is the disease described under the title of gangrenous sore mouth, by Dr. B. H. Coates (*North American Surgical and Medical Journal*, vol. ii, 1826), with the exception of a few cases. It is treated of by Dr. Condie (*Dis. of Child.*, 2d ed., p. 142.) under the title of gangrene of the mouth, and partly confounded with a much less frequent, and vastly more dangerous disease, which will be described hereafter, as a separate affection under that name. Of these different titles, the best writers prefer that of ulcerative stomatitis, as most expressive of distinctive features of the disease.

Frequency.—This form of stomatitis is not very *frequent* in private practice, but sometimes prevails extensively in hospitals, and other public institutions for children, where it often assumes an epidemic character.

Anatomical characters are then those of severe simple stomatitis with ulceration. The ulcers commence according to M. Taupin, as small white, or light yellow points, which consist of a plastic exudation under the epithelium. This exudation gives rise to ulceration of the mucous membrane lying over it. Hence the name, ulcero-membranous stomatitis, applied to this disease by Rilliet and Barthez. The inflammation usually begins upon the gums and extends along the buccal surface. Wherever it commences, there soon appear little white points underneath the mucous membrane, producing slight prominence of it. These points, which are fibrinous, and the product of the inflammation, gradually enlarge. Some unite and give rise to large, irregular ulcerations; others remain isolated, producing smaller and more regular ulcers. There is, indeed, no uniformity as regards the size and shape of the ulcers. In the folds of the buccal membrane they are apt to be elongated, while inside the lips, or where the surface is smooth, the circular or oval form predominates.

Ulcerous stomatitis is usually confined to that part of the buccal surface which covers the gum, or is in their immediate vicinity, but in rare cases it affects a considerable part of the mouth.

If the disease is severe, there is considerable swelling around the ulcers, but the swollen part is soft and cushiony, and not very tender on pressure. The soft and yielding nature of the swelling serves as a means of diagnosis, between this disease and the premonitory stage of gangrene; since, in the latter affection the swollen part is more indurated.

If the disease grows worse, more ulcers appear; the plastic exuda-

tion, if detached, is renewed, or it becomes thicker by the formation of new layers. The ulcers grow deeper and wider, and their edges more vascular.

If, on the other hand, there is improvement, the swelling subsides, the ulcers become more clean, their bases approach the level of the mucous membrane, and present a granulating appearance. Finally, the mucous membrane is reproduced. A considerable time after the ulcers are healed, the new membrane which occupies their site, has a redder hue than the adjacent surface.

Causes.—It is sometimes produced by acidity of the canal. The predisposing causes, according to Meigs and Pepper, are epidemic influences. Personal uncleanliness, poor food, dirty, humid apartments, etc., favor its development. In fine, a cachectic condition, however produced, is a common predisposing cause. It frequently occurs when the system is reduced or enfeebled by acute diseases, as after the essential fevers, and thoracic and intestinal inflammations. In protracted entero-colitis of infants, it is sometimes severe and obstinate, and a case in which this complication arises usually ends unfavorably.

Occasionally several cases occur together, or consecutively in the wards of a hospital, and this has led some observers to believe that ulcerous stomatitis is contagious. But its prevalence under such circumstances is attributable to the fact that there is a common exposure to the influences which gave rise to the disease, just as a whole household exposed to malaria may be seized with intermittent fever. Difficult dentition is also an occasional cause.

Symptoms.—The symptoms in ulcerative stomatitis are more severe than in the simple form. There is more fever, more salivation and more fretfulness. The ulcerated surface is sometimes very tender, so that there is but little sleep. Drinks, unless bland and lukewarm, are painful, and if the ulcers are on the lips, or the front of the mouth, the infant nurses less eagerly than usual, and even with reluctance. In these cases it sometimes weans itself. Occasionally the submaxillary glands are tumefied, hard and tender. The breath always has an offensive odor. In mild cases, in which the stomatitis is of limited extent, this odor may scarcely be noticed, but in severe cases it is almost like that exhaled from putrid substances.

Diagnosis.—The diagnosis is, as a general rule, very easy if proper attention be paid to the characteristic features of the disease. It has, as already stated, been very often confounded with gangrene of the

mouth. The method of distinguishing between the two will be given in full in the article on that disease. From thrush it is to be distinguished in the manner in which each develope, and by the fungus of thrush.

Prognosis.—A favorable prognosis may be given unless the patient is in a decidedly cachectic condition, or there is a serious coexisting disease. Under such circumstances, it may be protracted. If death occur, it is due to the cachexia, or to some pathological state quite distinct from the stomatitis. Ulcerous stomatitis, when the ulcers are small and the inflammation of limited extent, is of course more easily cured than when it is extensive, and the ulcers are large.

This disease is very liable to return, unless the general health is good.

Treatment.—A good deal of confusion seems to exist in reference to this disease. It is often confounded with aphthæ and gangrene. Therefore the indications are somewhat mixed. In selecting the remedy symptoms should be the only guide, and the description rather than the name.

Goullon says: “*Acidum Nitr.* when small ulcers are present. *Mercurius* in case of great flow of saliva. But from the internal and external application of *Borax*, (1st or 2nd trit.,) beneficial results have been obtained. He insists that everything containing sugar and casein is to be avoided, since the ulcers owe their origin to a surplus of acidity.”

Croserio says: *Acid. Sulph.*, a drop in a glass of water, a teaspoonful every three or four hours, is the most appropriate specific; *Merc.* 12th is also a specific, especially when there is much saliva in the mouth; if the disease is not cured in five or six days after the taking of *Merc.*, we may give tincture *Sulph.* 30. *Borax* has succeeded with me when all other medicines had failed. (Homœopathic Manual of Obstetrics, p. 138.)

Arsenicum.—“Complains of cankers at the root and left side of her tongue, which presented deeply excavated sores of pea size, covered with a whitish secretion. These were removed within two days, by the use of *Ars.* 3-30c, (3 pellets of the 30th contact potency), every three hours. (High Potencies, p. 23.)

Ruddock gives the following indications:

Mercurius.—Slight cases; fetid breath and abundant flow of saliva.

Kali chloricum.—When *Mercury* has been administered in excess; or when there is great soreness, fetid breath and ulceration. A wash,

(10 grains, to water one ounce), or the first trituration, may be used.

Hydrastis.—Swelling, dark redness, and soreness of the tongue, gums and cheek; ulceration of the lips and tongue; tenacious mucous in the mouth.

China.—When the acute symptoms have subsided.

The first care should be to remove the cause, e. g., want of cleanliness, errors in diet, etc. The food should be principally milk, or milk and soda water. When there is prostration, beef-tea or good animal broth is requisite.

Dr. Laurie relates the following interesting case: "A girl about five years of age, was suffering from aphthous inflammation of the mouth and tongue. The father had been applying a lotion of bark and *Borax*, as a wash for the mouth, and had given *Magnesia* and *Rhubarb* internally, without benefit. She was restless and feverish; lips much swollen; mouth and tongue covered with aphthous sores; breath very fetid; saliva flowing; chin excoriated, and any attempt to take food was attended with much suffering. A small portion of *Merc. sol.*, 3d trit, in a wine glass of cold water, was given, to be administered three times a day in teaspoonful doses. In two days the complaint entirely disappeared, and the child was quite well." (*British Journal of Homœopathy*, vol. x, p. 374.)

In the case of an infant with aphthæ, whose mother had cracks on the nipples, and suffered much pain from nursing, the mother took *Borax*, and applied a lotion of it to the cracks of the nipples; the cracks were healed, and the child was cured of the aphthæ. (*British Journal of Homœopathy*, vol. vii, p. 505.)

Dr. Hedges states his experience as follows: "*Borax*, both internally in the 3d decimal, and as a wash, is my first remedy as a rule. *Nitric acid*, 2d or 3d dec., *Merc. cor.* 3d dec., or *Hydrastis* 3d, in the order named, I find best where *Borax* is ineffectual, or not indicated."

Alfred Vogel says: "*Calomel* in children produces a disease of the mouth that cannot be distinguished in any way from stomacace, unless the absence of contagiousness of stomacace mercurialis, above-mentioned, is to be set up as a diagnostic mark.

"By this remark, and the fact that *Mercurius* is Homœopathically indispensable in stomacace, we again see the correctness of the law of the simile confirmed.

"Besides *Acid. nitri.*, *Sulph.*, and against stomacace catarrh, *Borax* is indicated. Since *Borax* is used Allopathically, even against catarrhal inflammation of the buccal mucosa, there could, as regards stom-

acace, also be no objection raised Homœopathically against *Kali chlor.*; especially according to the testimony of able Allopathic therapeutists, it is said to be the most specific remedy for it existing." (Scrofulous Affections, p. 78.)

One dose of *Merc. sol.* H. 2 gr. 1, removed stomachache, bad breath, swelling of the glands, diarrhoea, and fever heat in the evening, in a child. (Goullon on Scrofulous affections, p. 204.)

"If attacking infants, I resort to *Merc.* with the best results, after which I frequently give *Carbo veg.* or *Borax*.

"If originating in gastric disorders, in the case of adults and older children, I often derive the best advantage from *Capsicum*, in the case of fat people, and from *Nux vom.* or *Sulphur* in the case of thin persons; for rheumatic stomachace I find *Dulc.* or *Merc.* excellent; for scorbutic, *Carbo veg.*, *Staphys.*, *Merc.* and *Natr. mur.*, and for mercurial stomachace, *Carbo veg.*, *Dulc.*, *Lachesis*, *Calc.*" (Jahr's Forty Years' Practice, p. 108.)

Bayes says (Applied Homœopathy, p. 119), "in aphthous ulceration of the mouth, with moist furred tongue, and some swelling of the gums and cheeks, a few doses of *Mercurius sol.* 7, are often very useful. *Phytolacca*, and in some cases *Chlorate of Potassa*, and both internally and as a gargle, are more generally applicable to these cases."

GANGRENE OF THE MOUTH.

Gangrene of the mouth, Cooper (Surg. Dict., p. 332), describes as a deep, foul, irregular, fetid ulcer, with jagged edges, on the inside of the lips and cheek, attended with a copious flow of offensive saliva. It is a perfect specimen of phagedenic ulceration, and in its worst forms not unlike hospital gangrene, as I have seen in several deplorable instances. It also resembles the ulceration and sloughing in the mouth produced by *Mercury*.

Gangrene of the mouth begins, generally, by ulceration of the mucous membrane of the cheek, which after a longer or shorter time, runs into gangrene, and extends rapidly to the gums; after a few days, if the disease be not arrested, the central tissues of the cheek become thickened and indurated, an eschar forms upon the integument, which spreads in depth and width, until at last the cheek may be perforated, the whole side of the face and jaws destroyed, the teeth loosened, and the maxillary bones exposed and necrosed.

Synonyms.—It is known by a great variety of names: *Gangrænopsis*, *cancrum oris*, *gangræna oris*, *kanker of the mouth*, *gangrenous*

erosion of the cheeks, of Underwood ; necrosis infantilis, gangrenous stomatitis, noma, etc.

Frequency.—It is a frequent disease in the hospitals for children in Europe, and a not uncommon one in institutions of the same kind in this country. It sometimes prevails endemically in hospitals. It is a rare disease in private practice, and is seldom seen excepting in public institutions.

Etiology.—*The predisposing causes* are many. The disease is nearly, but not exclusively, confined to the period of childhood. It is most common between the ages of three and six years; it is very rare, but does sometimes occur in infants; and is of nearly equal frequency, probably, in the two sexes. Unfavorable *hygienic conditions* constitute a strongly predisposing cause. Children living in hospitals, or any crowded institution ; those whose parents are poor and in want, and whose constitutions have been greatly deteriorated by long illness, by the tubercular diathesis, or by acute diseases, are particularly apt to be attacked. It almost always follows upon some previous acute or chronic disease, particularly measles, or some other acute exanthem; pneumonia ; entero-colitis ; whooping cough ; long continued malarial fevers, etc. MM. Guersant and Blache say, (Dict. de Med. t. 28, p. 601,) "The existence of some anterior disease is a necessary condition of gangrene of the mouth ; we have never known it, nor has M. Baron, to occur as an idiopathic affection." It has been affirmed by some persons to be *contagious*, but this is exceedingly doubtful. The fact of its occurring sometimes in an endemic form, has already been referred to. It has been known, also, to prevail as an epidemic.

The *exciting causes* can rarely be ascertained with any certainty. Meiggs and Pepper declare that the only one which seems to have been proved to exist in some instances, is the exhibition in large doses of the mercurial preparations, and even this is questioned by some very good authorities. *Mercury* is not now so freely used as formerly.

Anatomical Characters.—Gangrene of the mouth, says Smith, is often preceded by ulceration of the mucous membrane, at the point where it is about to commence. This ulcer may continue a considerable time before the gangrene commences. The tissue around the sore becomes inflamed, thickened and indurated. The induration extends, and soon the purple hue of gangrene appears at or near the ulcer, and increases. The next stage in the progress of gangrene, is sloughing of the portion, the vitality of which is lost.

The slough does not present the appearance of uniform decay.

While the color is generally dark, there are in the mass fibres of cellular tissue, or even bloodvessels, which remain unchanged, or are but partially decomposed. After separation or sloughing of the part, where the vitality is first lost, the surface of the excavation, if the disease is not checked, has a dark, jagged, and unhealthy appearance. Commencing with the mucous membrane, and the tissue immediately underlying it, the disease extends on the one side towards the skin, and on the other towards the deeper seated structures of the jaw. According to Billard, the swelling which precedes and surrounds the gangrene, is in great part oedematous.

This disease is occasionally primary, but in a large proportion of cases, it is secondary. Occurring secondarily, its symptoms are often masked by those of the antecedent and coexisting affection. Under such circumstances, attention is sometimes first directed to the mouth by the loosening of one or more of the teeth, or the appearance on the skin of a livid, circular spot, which indicates the approach of the disease to the cutaneous surface. The mucous membrane presents a dark red appearance to the distance of a few lines beyond the point of gangrene, and it covers tissues which are inflamed and indurated, and about to become gangrenous.

The tongue is usually more or less swollen, unless the disease is mild; an offensive odor arises from the gangrene, due to the evolution of sulphuretted hydrogen, and other gasses. There is great difference in the extent of the destruction, and the gravity of the disease, in different cases. It may sometimes be arrested by proper applications; and a favorable change in the general health of the child, at an early period, when there is little loss of substance. In other cases, it extends till it perforates the cheek, or even destroys a considerable part of the side of the face, and, extending inwards, attacks the periosteum of the maxillary bone, destroying the gum and teeth, and denuding the alveoli. Recovery, if it take place at all under such circumstances, is with the loss of a portion of the bone, and with deformity.

The duct of Steno is sometimes included in the gangrenous portion, but it commonly resists the destructive process, and remains pervious.

The symptoms of gangrene of the mouth so often occur in connection with other diseases, that they are, in a large proportion of cases, blended.

There is usually prostration, more and more pronounced as the gangrene extends. The features are ordinarily pallid, but occasionally

their normal color is preserved for a time; the expression of the face is melancholy, but composed. Sometimes the child is fretful if disturbed; at other times it will quietly consent to an examination. The suffering is not proportionate to the gravity of the disease. There is less pain, often, than in some of the forms of stomatitis which are unattended with danger.

As the disease advances, the body and limbs gradually waste, the eyes are hollow, or, if the gangrene is near the orbit, the eyelids become oedematous, the lips are infiltrated, and both the lips and nostrils are often incrusted. If the cheek is perforated, alimentation is rendered more difficult, and the appearance of the child is melancholy in the extreme.

The tongue is usually moist; it is occasionally swollen. The saliva flows from the mouth, either pure, or mixed with offensive sanguinous matter. Unless the disease is slight, there is the peculiar gangrenous odor. The appetite is sometimes poor, at other times it is preserved through the whole sickness. There is no vomiting or, sometimes, looseness of the bowels from complication. The thirst is sometimes great; the pulse is usually accelerated and feeble, except in mild cases.

The skin, in the commencement of the disease, is hot. When the vital force is much reduced, and especially as the disease approaches a fatal termination, the face and limbs become cool, and the surface generally presents a waxen or ashy appearance. There is no derangement of the respiratory system. Those cases which are attended by a cough, or accelerated respiration, are really cases of bronchitis or pneumonia, coexisting with the gangrene.

Churchill says, (p. 446), that there appears to be several phases of the disease, differing in degree, if not more essentially.

One variety is described by Dr. Cuming (Dublin Hosp. Reports, vol. iv, p. 341), as occurring in children between twenty months and seven years of age.

Richter, (British and Foreign Medical Review, vol. vii, p. 470) describes a variety with gangrene at the angles of the lips, or upon the cheeks, occurring suddenly, and with little general disturbance. In some instances, there is a red spot for a few days preceding the gangrene. When the sloughs separate, we see that the gangrene was but superficial, there being very little loss of substance. Such cases are apt to occur after acute affections of the skin, as measles, scarlatina, small-pox, etc., and generally heal without trouble.

Diagnosis.—Some authors have described as identical affections, under the title of gangrenous stomatitis, the disease under consideration, and the one already treated of, ulcerative stomatitis. This has been done particularly by M. Taupin, who is followed in his description by M. Valleix (*Guide du Med. Prat. t. iv.*). Coates, in his valuable paper on the “gangrenous sore mouth of children,” (*Loc. cit.*) mingles the description of these two diseases. The difference between them, as to frequency, symptoms, course, amenability to treatment, and termination, which are fully pointed out in the diagnostic table below; and lastly the example of MM. Baron, Billard, Guersent, and Rilliet and Barthez, and Dr. G. B. Wood, and almost all authors upon this subject, fully establish them as different and distinct diseases.

The diagnosis of gangrene of the mouth is, in most cases, very easy. The ulceration of the mucous membrane, followed by gangrene; the deep-seated induration of the cheek, at first pale on the outside, then dark colored, and terminating after a time in a characteristic slough; the course of the malady, and the nature of the general symptoms, will generally prevent any difficulty in the recognition of the disease.

From ulcerative stomatitis it may be distinguished by attention to the points laid down in the following table, taken from MM. Rilliet and Barthez.

ULCERATIVE STOMATITIS.

Begins by ulceration, or pseudo-membranous plastic deposit.

Odor very fetid, and sometimes gangrenous.

But little extension of the local lesion, which always retains same appearances.

But little swelling of the cheek or lips, or simply œdema of those parts, without deep-seated induration, tension, or unctuous appearance.

Saliva rarely so considerable as to flow from the mouth; when present sometimes sanguinolent; never mixed with shreds of gangrenous tissue.

Never an eschar on the exterior.

GANGRENE.

Begins by ulceration, which is sometimes gangrenous from the first, or by œdema of the cheek.

Odor always gangrenous.

Considerable and rapid extension. The tissues assume a peculiar dark-grayish tint.

Extensive swelling and œdema of the cheek, with deep seated induration, tension, unctuous appearance, purple spots.

Saliva abundant; constant escape of fluid, at first sanguinolent, afterwards putrefactive.

Often an eschar upon the cheek or lips.

Never complete perforation of the soft parts; denudation of the bones never occurs; loss of the teeth very rare.

Course of the disease very slow when left to itself; recovery rapid under the influence of treatment.

Perforation of the soft parts frequent; denudation of the bones constant; loosening of the teeth constant, and their loss frequent.

Course rapid, and fatal termination, as a rule, when the disease is left to itself, and sometimes in spite of all treatment.

Gangrene of the mouth may be confounded with malignant pustule. The method of diagnosis has been drawn by M. Baron in the following words: Malignant pustule always begins on the exterior; affects the epidermis first, and extends successively to the corpus mucosum, chorion and subjacent parts; whilst, on the contrary, the gangrene under consideration attacks the mucous membrane first, then the muscles, and lastly the skin. (Meigs and Pepper.)

Prognosis.—The prognosis of true gangrene of the mouth is exceedingly unfavorable. The great majority of the subjects perish in spite of all that can be done. Coates (*Loc. cit.*, p. 14) says that a black spot on the outer surface of the swelling "has always been, in my experience, the immediate harbinger of death." It is proper to state, however, that cases have been reported as recovered, in which the gangrene had produced a hole through the cheek." Rilliet and Barthez state that "death is the ordinary termination of gangrene of the mouth; though there are instances of recovery on record." Of twenty-nine cases analyzed by them, only three recovered. Guersant and Blache (*Loc. cit.*, p. 596.) state that unless arrested in the formative stage, it ends fatally almost constantly, in from five to ten days, and frequently before perforation has taken place. Of thirty-six cases observed by M. Taupin, in the Children's Hospital at Paris, not one escaped. (Guersant and Blache, *Loc. cit.*, p. 597.) The authors of the *Compendium de Medecine Pratique*, say of this disease (*t. i*, p. 632.) "death is the almost universal termination." Dr. Marshall Hall (*Edin. Med. and Surg. Journ.*, xiv, p. 547), reports six cases of the disease, two of which followed measles, one repeated attacks of pneumonia, one fever, (type not mentioned,) one worm fever and one typhus fever. All but one, the case occurring in the course of typhus fever, in a girl twelve years old, died. This girl recovered, with, however, falling in of the right cheek, "a frightful chasm" on the left side of the mouth, and caries of a portion of the alveolar process, palate bone and second molar tooth. Recoveries sometimes occur, however, as in the case mentioned by Dr. Hall, after perforation, but nearly always with terrible

deformities, with adhesions of the walls of the mouth to the jaws, with incurable fistulæ, etc. Homœopathic treatment promises better results.

The prognosis is more favorable in private practice than in hospitals. The favorable circumstances, in any case, are: Good hygienic conditions; vigorous constitution of the child; the absence of dangerous concomitant disease; the continuance of appetite and strength; and a disposition to limitation and separation of the slough. Unfavorable symptoms are: Weak and debilitated constitution of the patient; severe coexistent disease; prostration of the strength; and extension of the sloughing process.

Epidemic and Idiopathic.—During an epidemic, one summer and winter, (Quar. Hom. Jour., vol. i, p. 41.) Dr. W. Arnold had frequent opportunities to observe the so-called idiopathic gangrene canker in children. Deviations in health, preceded, for the most part, only a short time the appearance of the disease; in a few cases scarcely any deviations were observed. They consisted in a greater degree of irritability, want of pleasure in eating, and in the usual sports of the child, and occasionally slight febrile paroxysms, with thirst. In those cases where the secretion of saliva was very abundant, the gums and inner surface of the lips were inflamed, so that the child could not bear to have them touched. On examination of the mouth, they found the mucous membrane of various colors; in one place bluish, in another black; covered with viscid mucus, which nearly encased the lips with a brown crust. The spots which in the beginning of the disease appeared single, quickly increased in size, and were soon converted into softening, variously colored and painful *ulcers*. Dr. Arnold saw most of the children when these ulcers had reached a certain grade of development. Their lips were generally much swollen, and there flowed from the mouth a mucus saliva, which, on the cheeks, and even on those places on the hand with which it came in contact, caused sores and ulcers similar to those in the mouth. The submaxillary glands were, for the most part, swollen and inflamed. In a higher grade of the disease, the gums, lips and tongue were so inflamed that those children in whom the disease was strongly marked, were not in a situation to take nourishment, or have the infected parts washed. The pernicious employment of *Muriatic acid* and rose-honey, while it evidently was injurious to the ulcerated parts, caused so much pain, that the children forcibly strove against the application. The consequence was, that those children to whom their mothers were

more indulgent in treatment than the physicians, came under Dr. A.'s care, and, in spite of the previous painful yet fruitless employment of medical means, were fortunately healed by means of *Arsenic*.

The children treated by him, if they did not suffer from scrofula actually developed, had at least, with few exceptions, an evident lymphatic constitution; more of them occupied damp rooms; a few lived near the Neckars (river). Most of them belonged to the middle class of society, and the majority were properly clothed and nourished. A damp summer was, doubtless, a developing cause. All the above symptoms were not so essential as to be considered indications for the choice of medicine to be employed. This he found in the resemblance of *phenomena*, as seen in the use of *Arsenic*; the symptoms caused thereby having a close resemblance to those of the disease in question. They consisted in swelling of the face, painful ulcers on the lips which prevented sleep, swelling of the lips, pimples around the lips, looseness of the teeth, and pain on moving the gums; falling out of the teeth, swelling of the submaxillary glands, cankerous sores upon the sides and extremity of the tongue, bloody mucus, and frequent secretion of viscid saliva.

Case.—The first child that came under his care was a well nourished girl, two years of age. She had been kept clean, and was in all respects well cared for. He knew no reason for the existence of the disease, nor could he find any in the personal condition and relation of the child, unless a lymphatic constitution, and dwelling near the "Neckars," be considered as such. Since neither of these was adequate to produce the disease, he was compelled to ascribe it to epidemic influences, which, however, offered no indication as to the therapeutic treatment. When treatment commenced, the canker had reached a high grade. He gave *Arsenic* 6x, and of this, the first two days four doses, a half grain each, daily. No effect was perceived, unless perhaps the evil was brought to a stand. He then had recourse to *Arsenic* 4x, one grain doses. The first dose had a remarkably soothing effect, so that the child slept, and after many hours awoke in a better condition. By the daily use of three equally strong doses, the amendment advanced so rapidly that after twelve doses had been given, he thought best to leave off medical treatment. Two days after new ulcers appeared, attended with much saliva, want of sleep, and other symptoms, all in a weaker grade; the child, in the meantime, having been exposed to no injurious influences. At once he resorted to *Arsenic* 4, and the first dose had the same quieting effect as in his

former treatment of the case. After the second dose, the child began to take nourishment, and the amendment was so rapid that after four days the cure was perfect; yet, for the prevention of a relapse, for a few days two doses were administered, which was followed by a permanent cure.

A similar result in reference to doses, cures, etc., was obtained in the other cases. Notwithstanding all his attention bestowed on the observation of the sick, he never saw any bad effect follow the employment of *Arsenic*, in doses of one grain each of the fourth decimal reduction. Frequently he had opportunity to observe that no amendment, or at least a very slow amendment, followed from the use of *Arsenic* of the sixth reduction. "The cures of stomachic affections by the use of *Arsenic*, which," he says, "have fallen under my observations, give rise to the following deductions:

"Canker is the manifestation of a general affection, and therefore requires the use of medicines which act upon the whole organism, and are suited to the peculiarity of this affection. This has been long known; and yet they have annoyed the sick with the use of local remedies, as acids, etc.; and even to this day there are many physicians liable to this charge. They came imperceptibly, through theoretical modes of observation, (rationalism, so-called,) to this choice of means, with a view of preventing disorganization, or the process of decomposition. The nature of the general affection in canker has been heretofore, neither by physical nor chemical means, so accurately determined that they could rely upon their knowledge in the choice of treatment. All the propositions and experiments derived from hypothesized modes of observation, have led to no fixed result. The only way to reach this is indicated in the "law of resemblances;" and this law, during the present year, had led me to the employment of *Arsenic*, which is proved to be an excellent medicine in these cases. Unless future observations prove the contrary, *Arsenic* must be looked upon as the best remedy for canker."

Treatment.—Hartmann says, "I recommend *Secale cornutum* for this disease, although *Arsenic*, according to several cases communicated by Dr. Arnold (Hirschel's Homœopathic Gazette), seems to deserve a preference over *Secale*." "If the second dose of *Arsenic* should be unable to arrest the disease, then is the period for the exhibition of *Secale*, second trituration. Among the physiological effects of *Secale* we have the following: The parts soon become cold and lead colored, and even black and gangrenous, the destructive process speedily invades the bone; bloody blisters soon terminating in gangrene; gangrenous, black, suppurating pock; tumors on the neck; anthrax; even the post-mortem changes correspond to those of noma.

Should not these symptoms induce us to try *Secale* in a disease where death is so certain, and every other remedy seems to leave us in the lurch? It is certainly more appropriate than the external use of acids, the chloride of lime, the sublimate, the cauterizations of the Old School.

"*China, Chlore, Iodine, Kali hyd., Acid. mur., Kreosotum, Silicea, Rhus tox.*, might be useful in some cases, but these remedies will be found less efficacious than the other two."

Teste thinks "Homeopathy as yet knows no specific for gangrene of the mouth, which seems however, to enter into the sphere of action of several medicines known.

"I have seen the disease arrested in the beginning by *Ipecacuanha*, at a low dilution, and in doses frequently repeated, (a teaspoonful every hour, of a solution of three drops of the third dilution, in four ounces of water.)

"In a more advanced period of the disease, I should not hesitate to prescribe, alternately, *Acid. muriaticum* and *Kreosotum*, at low dilutions and at short intervals, and even, if necessary, slight cauterizations with *Muriatic acid*, diluted with a little honey."

Ruddock, page 158, gives the following remedies :

Mercury when not caused by *Mercury*.

Muriatic acid, when associated with a severe disease like measles.

Nitric acid, when from the excessive use of *Mercury*.

Arsenicum, when there is extensive disorganizations of the mouth, with extreme prostration.

Sulphur in chronic cases.

Kali permanganate.—A wash of this remedy will diminish the fetor and assist the healing process.

Carbolic acid, diluted with water, makes an excellent wash for the mouth. The gums, teeth and mouth should be frequently cleansed.

As a diet, strong beef tea, raw eggs beaten up in milk and cod-liver oil, are generally necessary.

REMEDIES FOR AFFECTIONS OF THE BUCCAL CAVITY.

As regards special indications, the following are best adapted to ulcers in the mouth, *Merc.*, *Nit. ac.*, *Natr. mur.*, *Staphys.*, *Arsen.*, and sometimes *Hell.*

For swelling and soreness of the mucous lining, *Merc.*, *Dulc.*

For ptyalism, *Dulc.*, *Merc.*, *Nitr. ac.*, *Natr. mur.*, *Hell.*

For fetor from the mouth, *Merc.*, *Carbo veg.*, *Nitr. ac.*, *Dulc.*, *Hell.*, *Nux vom.*

For swollen gums especially, *Carbo veg.*, *Nitric ac.*, *Natr. mur.*, *Nux vom.*

For bleeding gums, *Merc.*, *Carbo veg.*, *Natr. mur.*, *Nitr. ac.*

For glandular swelling of the neck, *Dulc.*, *Hell.*, *Merc.*

For diarrhoea existing at the same time, especially, *Merc.*, *Nitric ac.*, *Arsen.* (Jahr's Forty Years' Practice, p. 109.)

Lobethal says: "Malignant aphthæ ordinarily demand the use of strong doses of *Mercurius*, (I mean by this the triturations, 1st, 2d, and 3d), and the *Muriatic acid*." (Homœopathic Examiner, vol. iii, p. 167.)

Dr. D. H. Paine says: "In many cases of common canker sore mouth, much benefit has arisen from the exhibition of *Mercurius* 1st or 3d, followed by *Arsenic*. In that which is popularly termed nursing sore mouth, of several years' standing, *Nitri acidum* has completely cured several cases." (Homœopathic Examiner, vol. iii, p. 207.)

Dr. Hedges states that "In cancrum oris *Mur. ac.* 1x, in water, is most reliable. In one severe idiopathic case, after failing with *Merc. viv.* and *Mur. ac.*, I cured the case from a most desperate condition with *Hydr.* internally, low, and as a wash. A spray of *Sulphurous acid* is excellent. This I found in cases following measles, in the Chicago Half Orphan Asylum. I have never tried the high attenuations with those severe cases. The proper feeding is a great thing in severe aphthæ and cancrum oris, especially the latter. Beef tea, milk cream, rare beef, extract of malt, eggs, and often egg-nogg, and gargles of dilute alcohol before eating. *China*, *Nux vom.*, *Arsen.*, *Sulph.*, *Phos. acid*, are needed to complete the cure."

DENTITION.

DEVELOPMENT OF THE TEETH — ERUPTION OF THE TEETH — DISORDERS OF DENTITION — ANOMALIES OF DENTITION — SECOND DENTITION — TREATMENT.

The teething process is one of the most important, as well as the most significant expressions of infant development. It is one that should be well understood in all of its bearings. All the diseases of children are not due to teething, but this physiological process occurring in a deranged system often arouses and complicates pathological changes.

To comprehend the importance and variety of the disorders incident to dentition, it is necessary to understand the development of the teeth, the method of their eruption, anomalies, etc.

DEVELOPMENT OF THE TEETH.

About the sixth week of foetal life, the mucous membrane covering the edge of the upper jaw presents a semicircular depression or groove. This is the primitive dental groove, from the floor of which the germs of the ten deciduous or milk teeth are developed. The germ of each tooth is formed by a conical elevation of mucous membrane, which constitutes the rudimentary pulp of a milk tooth. The germs of the milk teeth make their appearance in the following order: At the seventh week the germ of the first molar of the upper jaw appears; at the eighth week, that for the canine tooth is developed; the two incisor papillæ appear about the ninth week, (the central preceding the lateral); lastly the second molar papilla is seen at the tenth week, behind the anterior molar. The teeth of the lower jaw appear rather later, the first molar papilla being just visible at the seventh week; and the tenth papilla not being developed before the eleventh week. This completes the first or papillary stage of their development. The dental groove now become contracted, its margins thickened and prominent, and the groove is converted into follicles for the reception of the papillæ; by the growth of membranous septa, which pass across the groove between its borders. The follicles, by this means, become the alveoli, lined by periosteum, from the bottom of which the process

of the mucous membrane of the gum rises, which is the germ of the future tooth. The follicle for the first molar is complete about the tenth week ; the canine follows next, succeeded by the follicles for the incisors, which are completed about the eleventh or twelfth week ; and lastly, the follicle of the posterior molar is completed, about the fourteenth week. These changes constitute the second or follicular stage.

About the thirteenth week, the papillæ begin to grow rapidly, project from the follicles, and assume a form corresponding with that of the future teeth ; the follicles soon become deeper, and from their margins small membranous processes, or opercula, are developed, which meeting, unite, and form a lid to the now closed cavity. These processes correspond in shape to the form of the crown of the tooth, and in number to the tubercles on its surface. The follicles of the incisor teeth have two opercula, the canine three, and the molar four or five each. The follicles are thus converted into dental sacs, and the contained papillæ become [pulps. The lips of the dental groove gradually advance over the follicles from behind forwards, and uniting, gradually obliterate it. [This completes the third or saccular stage. which takes place about the fifteenth week.

The deep portion of the primitive dental groove is now closed in, but the more superficial portion near the surface of the gum, still remains open ; this is the secondary dental groove, and from it are developed the ten anterior permanent teeth. About the fourteenth week certain lunated depressions are formed, one behind each of the sacs of the rudimentary milk teeth. They are ten in number, in each jaw, and are formed successively from before backwards ; they are rudimentary follicles of the four permanent incisors, the two canine, and the four bicuspids. As the secondary dental groove closes in, the follicles become closed cavities of reserve. The cavities soon elongate, and recede from the surface into the substance of the gum, behind the sacs of the deciduous teeth, and a papilla projects from the bottom of each which is the germ of the permanent tooth ; at the same time one or more opercula are developed from the sides of the cavity ; and these uniting, divide it into portions ; the lower portion containing the papilla of the permanent tooth, the upper, narrower portion becoming gradually contracted in the same way that the primitive dental groove was obliterated over the sacs of the deciduous teeth.

As soon as the dental sacs are formed by the closing in of the fol-

licles, they gradually enlarge, as well as their contained papillæ. Each sac consists of two layers; an internal, highly vascular layer, lined by epithelium, and an external or areolo-fibrous membrane, analogous to the chorium of the mucous membrane.

The dental pulps soon become moulded to the form of the future teeth, and are adherent by their bases to the bottom of the dental sacs. In the case of the molars the base of the pulp is divided into two or more portions, which form the future fangs. During the fourth or fifth month of foetal life, a thin lamina or cap of dentine is formed on the most prominent point of the pulp of all the milk teeth. In the incisor and canine teeth this newly-formed lamina has the form of a hollow cone; in the molar teeth as many separate laminae are found as there are eminences upon its crown. These laminae grow at the expense of the pulp substance, increasing in breadth by a growth round their margins, and in thickness by a similar formation in its substance; the separate cones (if a molar tooth,) ultimately coalesce, and the crown is completely formed. The pulp now becomes constricted, so as to form the cervix; and the remaining portion becomes narrow and elongated to form the fang. The growth of dentition takes place from the surface towards the interior, until nothing but the small pulp cavity remains in the centre of the tooth, communicating by the aperture left at the point of each fang with the dental vessels and nerves.

As soon as the formation of the dentine has commenced, there is developed from the inner wall of the dental sac a soft, pulpy mass, the *mamel organ*, which is ultimately united to the surface of the dental pulp, or its cap of dentine. It consists of a mass of fibres, elastic and spongy, containing within its reticulations fluid albumen, and at the point of junction of each fibre, a transparent nucleus is visible. The surface towards the dentinal pulp is covered by a layer of elongated nucleated cells, the enamel membrane. The deposition of the enamel takes place on the outer surface of the cap of dentine. The cementum appears to be formed at a later period of life, by the periodontal membrane extending from the margin of the enamel downwards.

When the calcification of the different tissues of the tooth is sufficiently advanced to enable it to bear the pressure to which it will be afterward subjected, its eruption takes place, the tooth making its way through the gum. The gum is absorbed by the pressure of the crown of the tooth against it, which is itself pressed up by the increasing size of the fang. At the same time the septa between the

dental sacs, at first fibrous in structure, ossify, and constitute the alveoli; these firmly embrace the necks of the teeth, and afford them a solid basis of support. (Gray.)

The appearance of the twenty milk teeth, as those at the first dentition are termed, does not take place in an uninterrupted sequence, but in groups, separated by intervals of weeks or months. The following is the usual order and time of the cutting of the several groups:

Group I.—Between the fourth and seventh months of life, the two lower middle incisors appear almost simultaneously, whereupon a pause of three to nine weeks ensues.

Group II.—Between the eighth and tenth months of life, the four upper incisors appear, following shortly upon each other, at first the two central, then the two lateral. The second pause amounts to from six to twelve weeks.

Group III.—Between the twelfth and fifteenth months of life six teeth appear at once, namely, the four first molars, and the two lateral incisors; generally the molars in the upper maxilla first, next the lower incisors, and lastly the molars of the lower jaw. A pause until the eighteenth month ensues.

Group IV.—Between the eighteenth and twenty-fourth months of life, the canine teeth cut through. (The upper ones are called eye-teeth.) Again a pause until the thirtieth month.

Group V.—Between the thirtieth and thirty-sixth months, the second four molars finally make their appearance. This concludes the first dentition. (Vogel.)

The formula of human dentition may be expressed thus:

$$\begin{array}{ccc} 2 & 2 & 1 & 1 & 2 & 2 \\ \text{I} & : & \text{C} & : & \text{M} & = 20 \\ 2 & 2 & 1 & 1 & 2 & 2 \end{array}$$

Many divergencies from these rules will be met with, as children may be born with one or more of their teeth already cut, or the teeth may appear earlier than usual, or out of the usual order. In some families the upper incisors always appear before the lower, or one of the molars or the canine teeth precede the incisors; but these irregularities are of no importance. Delayed appearance of the teeth is, however, of greater moment, for it generally indicates some fault in nutrition, or a rickety habit of body. (Steiner.)

DISORDERS OF DENTITION.

As soon as dentition commences, there is generally an increased

redness, attended with considerable heat and tenderness of the gums, and an increased secretion of the saliva. Occasionally there is slight febrile reaction, redness of the cheeks, watering of the eyes, and augmented thirst. The discharges from the bowels are more frequent and fluid than usual, and occasionally of a greenish hue, and the stomach is morbidly irritable, the matters discharged from it having often a strong acid smell. As the advancing tooth approaches the surface of the gum, the fingers of the child are frequently held in its mouth ; and it presses the nipple firmly between its gums in sucking, or any object which it can readily seize and convey to its mouth ; this appears to ease some uneasy sensation experienced by the child, as does also pressing or rubbing the gums with the finger. (Condie.)

Stomatitis frequently occurs, the catarrhal form being the most usual one, and along with it sometimes occurs enlargement of the submaxillary and the lymphatic glands in the neck, seldom ending in suppuration. Ulcers of the frenum linguæ are often seen at the time of cutting the first lower incisors, about the size of a linseed, surrounded by a reddened ring, and leaving grayish yellow bases, disappearing in eight or ten days. There are more or less febrile symptoms, increased temperature of the skin, exaltation of the pulse, and reddening of one or both cheeks, often accompany the process of dentition ; but they are transient, like all the troubles in this physiological change, and have no typical character.

Nervous symptoms are common, such as broken sleep, restlessness, crying and whimpering, twitchings and slight spasms of the muscles of the face and extremities, or even eclampsia. Convulsions of a more severe kind are frequently observed prior to the eruption of each group of teeth.

Diarrhœa is a very common symptom in teething children, and so close is the connection that Bouchut found that only twenty-six out of one hundred and thirty-eight children entirely escaped it during the period of the first dentition, while forty-six suffered from it severely.

A mild diarrhœa, consisting of five or six evacuations in the twenty-four hours, is considered rather beneficial than otherwise, inasmuch as it acts as a preventive of cerebral affections. The transition, however, of this simple catarrh of the bowels, into an infiltration of the follicular apparatus of the mucous membrane, attended by profuse discharges and rapid general emaciation, very frequently occurs, and in many instances, terminates in profound collapse and death. (Steiner.)

Teething is so often accompanied by *cough* that "teething-cough" has become a popular expression; and when this symptom is simply reflex in its origin, it is not accompanied by any alteration in the pulmonary mucous membrane, and therefore is not accompanied by any auscultatory signs. It may, however, be very persistent and troublesome. There are other cases in which the bronchitis seems to be induced by external causes. The large quantities of saliva secreted at this time soaks through the clothes covering the chest, and produces a diminution of temperature of the breast, as a result of which swelling and increased secretion of the bronchial mucous membrane ensue. If the chest is prevented from becoming wet, for example, by inserting a piece of oiled silk between the garments, this class of cases will pass through the whole process of dentition without once being affected with bronchitis. (Vogel.)

Pneumonia should not be overlooked during the process of dentition, and unless it is watched for it may fail to excite apprehension, since the symptoms are apt to be regarded as the result of that sympathetic irritation of the air tubes which so often accompanies dentition, and the time for action will pass unemployed. The disease, comes on most frequently in weakly children, is unattended by much constitutional reaction, and often runs a somewhat chronic course; while its nature is further obscured by the tendency to diarrhoea, which exists during dentition, and which is now excited by the thoracic affection. The purging often becomes the most striking symptom, and all means are employed to suppress it, and to check the vomiting which generally attends it. These efforts, however, are unavailing; the child wastes daily, and its skin hangs in wrinkles about its attenuated limbs, while the abdomen becomes tumid from the collection of flatus in the large intestines, and tender on pressure, and the tongue grows red dry and chapped, or covered with aphthous ulcers. The cough now perhaps attracts notice; but both it and the bronchial breathing in the lungs are probably looked on as indications of phthisis. After death, no tubercle is found in any part of the body, no disease in the intestines, but pneumonia, with purulent infiltration in both lungs, a disease which probably might have been cured if it had been detected. (West.)

Skin.—Children with a fine smooth skin, or the progeny of parents who are affected with chronic skin disease, and attacked in each of the five periods of dentition by one or the other form of the eruption, which in the subsequent dentition periods displays tolerably similar

pathological characters to those which took place at their first appearance. The principal forms are :

Urticaria.—An eruption of wheals. By this we understand a severely itching eruption of the skin, of several lines in circumference, and mostly round, or sometimes of an oblong shape, not very prominent, and having a flattened upper surface. Most of the wheal-like eruptions are of the normal integumentary color, while the part of the cutis contiguous to them appears to be reddened. Occasionally they are even paler than the rest of the skin ; the epidermis never becomes detached from the cutis. The stings of nettles in some persons, also the bites of fleas, will produce a wheal-like eruption. It disappears almost entirely in a few hours. The red zone remains for a short time, but that also fades very rapidly, and then nothing is to be seen of the eruption. From fifteen to twenty of these circular patches make their appearance, either simultaneously or one after the other disappear, and are succeeded by others on other parts of the body. The itching is very troublesome and annoying, for which bran baths and the inunction of fat should be employed, to mitigate this distressing symptom.

Lichen and Prurigo.—These are two papular exanthems ; the first also called lichen strophulus, has its hard papules mostly accumulated in clusters, while the papules of the latter are flatter, lower, and isolated. In both exanthems the tubercles are at first paler than the normal skin, but through scratching are soon bereft of their apices, and in place thereof display a small brown crust of the size of a pin's head. If a lichen papule is pricked open very superficially, with a fine needle, a drop of blood will exude ; a prurigo papule contains only a minute drop of serous fluid, but by severe scratching may also be made to bleed. When these scratched papules are situated near each other, their crusts will coalesce and present a large ulcerated surface, and it will then be impossible to recognize the primary manner of their origin.

Eczema and Impetigo.—By eczema we understand an inflammation of the skin produced by an accumulation of serum beneath the epidermis, in the form of minute, aggregated vesicles, and is distinguished as eczema simplex and eczema rubrum. In eczema simplex the skin is slightly swollen and reddened. Thin, yellow scales form after the vesicles have burst and dried up, and after they have fallen off, a new epidermic layer is produced. Eczema rubrum mostly develops from the former, and is differentiated from it by the integument around the

vesicles being of a darker red color, and more tumefied, and the course of the disease becoming more chronic. There is a tendency to form a new crop of vesicles, and a red, infiltrated, furfuraceous skin remains behind for a long time after the crusts have desquamated. In impetigo, in place of vesicles larger pustules filled with matter, originate, usually aggregated, and after they have ruptured, thick, moist, yellowish-green or brown scales form, and when these have dropped off, the reddened corium will be seen exposed, discharging a sero-purulent fluid, and soon become covered anew by a thick crust. The affected part of the skin remains brownish red and infiltrated for a long period after recovery has taken place.

Blennorrhœa of the conjunctiva palpebrarum. This occurs at the time of the eruption of the upper cuspid and incisor teeth. Both eyelids, particularly the upper, suddenly swell up, and become so infiltrated that it is only with the utmost difficulty, and scarcely ever without bleeding from the squeezed eyelid, that a sight can be obtained of the globe. The discharge is not so yellow, and purulently thick as in ophthalmia blennorrhœa neonatorum, but more muculent, shreddy, resembling more the discharge from the nose after a catarrh of the nasal mucous membrane has subsided. The parts around the lids are generally eroded. (Vogel.) When it is borne in mind that the floor of the Highmorian cavity is often barely of the thickness of paper, it will readily be understood that a propagation of the congestion or inflammation may readily take place, and as the mucous membrane of this cavity stands in direct communication with the conjunctiva through the nasal passages and lachrymal sac, the inflammation of the ocular membrane is but the extension of a similar process in the antrum. The prognosis of this form of ophthalmia is favorable.

Disturbances of the *urinary system* are sometimes seen, either as incontinence, occurring in children previously quite free from it, or in very frequent micturition, the child passing a quantity of clear urine of low specific gravity every ten or fifteen minutes, or on the contrary, of spasmodic retention of urine. As these symptoms are always reflex, they last only a short time, from two to three days, and then disappear without any ill result, to return again, perhaps, when some more teeth are being cut. (Steiner.)

The above described derangements occur with such frequency during the course of dentition, that the latter is regarded, and rightly so, as standing in a causative relation to them. That mothers, nurses, and even medical men are apt to ascribe any or all disorders occurring

during the eruption of the teeth to this cause alone, is only too well known, and is unscientific. Another class of paediatricars, believing that a physiological process should not incur any blame, refuse to credit any derangements to this function. The observing physician will avoid both these extremes, considering on the one hand the proneness toward generalizing too much on the etiology of this difficulty, the on the other that too great reliance should not be placed upon and normal performance of a function in a faulty organism. (Vogel.)

In many instances, the various diseases which afflict the infant may be traceable to other causes than that of teething, such as the quantity or quality of its food, its clothing, exposure or too careful housing, that by judicious management will cease to act as causative influences, and yet in other instances dentition may almost be considered as pathological in so far as it rouses into activity the tubercular or other latent dyscrasias, to say nothing of the exhaustion produced by the tardy evolution of the teeth. In all instances, therefore, great care should be taken not to mistake the cause for the effect, or *vice versa*.

ANOMALIES OF DENTITION.

Allusion has already been made to the irregular manner in which the different groups of teeth make their appearance. The anomalies of the teeth themselves are of sufficient importance as to merit attention, prominent among which are those of the enamel. This may be either defective or discolored. Its defective formation appears either in excavations dispersed over the surface of the tooth, or there are complete furrows or transverse notches around the crown of the tooth, the body being still covered with, or entirely deprived of, enamel. This atrophy is the result of those severe diseases which the child may have been suffering from during the development of the enamel. Acute exanthems are said to produce the dispersed excavations; acute inflammatory diseases the furrows, and rachitis has often been observed to be the cause of the entire absence of the enamel. The incisors of rachitic children are usually small, appear late, and are very liable to become carious. Acute exanthems are counted among the causes of this abnormality, especially by such writers as classify the teeth with the dermal tissue.

SECOND DENTITION.

The fact is well established, though often overlooked in practice, that second dentition occasionally deranges the functions of organs and gives rise to pathological symptoms. Rilliet and Barthez men-

tion particularly neuralgic pains, rebellious cough, and diarrhoea as effects which they have observed. Rilliet relates the case of a girl eleven years old, who had a very obstinate and protracted cough, the paroxysms lasting often half an hour to an hour. This cough immediately and permanently disappeared when the molars pierced the gums.

Jackson (*Letters to a Young Physician,*) says: "I have seen persons between twenty and thirty years of age much affected by a *wisdom tooth* not yet protruded, and distinctly relieved by cutting the gum. But I think the most common period of suffering from the second dentition is from the tenth to the thirteenth year. The most characteristic affections are wasting of flesh, and nervous diseases. The boy loses his comeliness, and his complexion is less clear, while emaciation takes place in every part, though mostly, perhaps, in the face. The nervous symptoms are various, but the most common are a change in the temper and a loss of spirits. With these there is some loss of strength. The patient is unwilling to engage in play, and soon becomes tired when he does do it. Among the direct symptoms which are not uncommon, I may mention pain in the head and in the eyes. The headache is not commonly severe, but it is such as inclines the patient to keep still. The eyes are not only painful, but are often affected with the morbid sensibility to which these organs are subject. I have known boys truly anxious to pursue their studies, obliged to give them up on this account; and these not having the disposition to play, will of choice pass the day with their mothers, and increase their troubles by the want of air and exercise. Nervous affections of a more severe character are sometimes manifested."

Whether the symptoms which have been attributed to second dentition have always been due to this cause, is questionable. Practically, however, it matters little, whether we recognize dentition as the cause, or assign something else. Hygienic and medicinal measures to improve the general health, will usually suffice to relieve the patient. The remedies which Dr. Jackson found most useful were: First, a relief from study or from regular tasks, yet using books so far as they afford agreeable occupation or amusement. Second, exercise in the open air, preferring the mode most agreeable to the patient, and in more grave cases, the removal from town to country. (Smith.)

TREATMENT, HYGIENE AND THERAPEUTIC.

(1). *Hygienic*.—The teething process is a very good index of the bony nutrition of the child. If there has been an excess of lactic acid generated so that the *Phosphate of Lime* in the milk and blood has been destroyed, and even the bony system itself has been partially dissolved and carried off by the kidneys; in such cases we may expect tardy dentition, and in its place a pouring out of the serum of the blood upon all the surfaces into the cavities of the body. These cases will have frequent attacks of snuffles, bronchial catarrhs, perspiration, eruptions, enuresis, diarrhoea, etc., due to malnutrition, and may go off with hydrocephalus. These symptoms of imperfect feeding of the bony system ought to be early recognized, and anticipated by proper food or management, that will arrest the tendency to acidity, upon which this malnutrition depends.

If the milk of the mother generates colic, green stools, etc., and *Nux*, *Calc.*, or *Cham.* does not correct, her diet should be so changed so as to produce a more easily digested milk. (See Food.) If the child is feeding, attention should be directed to prevent the generation of much lactic and butyric acids, as well as to supply the system with *Phosphate of Lime*, by feeding with Graham or oatmeal. The bottle will need extra attention to keep it sweet. The child will need to be carefully nursed and should get plenty of fresh air.

(2). *Therapeutic Indications*.—As teething has been supposed to be the cause of a great variety of disease expressions, so we find that the list of remedies for difficult dentition is also large. There is therefore ample room for choice. As we select the similar remedy for the symptoms in a given case, it does not here matter whether the teeth eruption is the cause, or whether it is only a secondary incident. "When the teeth pierce the gums with difficulty, the gums remaining a long time swollen, white and painful, we should give *Calcarea* 30th, repeated every eight days for three or four weeks; if any accident should happen, the child should smell of *Camphor*.

"When the child is very much agitated, now crying, and then too gay, with a little fever, we should give *Coffea*, repeating it for three or four days. If the symptoms do not disappear, we may give *Aconite*, and if these derangements still persist, *Chamomilla*. If there is violent thirst, heat, fever, if the child cries often and thrusts his hands into his mouth, if he is frightened in his sleep, we should also give these remedies, *Aconite*, *Chamomilla*, taking care not to pass to a second medicine until after the action of the first is exhausted. If

there is a slight dry cough with constipation, we should give *Nux vom.* rather than *Cham.*, which suits especially diarrhoea. This last medicine is particularly indicated when the child has at the same time a dry cough like whooping cough, restlessness at night, sucking often with burning heat, redness of the skin and eyes, anguish, difficult, short, quick and loud respiration, trembling and twitchings in some of the limbs, or a great number of these symptoms. If in these cases *Cham.* does not suffice, we should give *Bell.* 30th.

"If there are signs of approaching convulsions, if the child has a diarrhoea, paleness of the face, eyes dull, little appetite, if he wishes always to be carried, and lays his head upon the shoulder of the person who carries him, *Cham.*, may prevent their development. If the symptoms which indicate *Ignatia* exist, this medicine would also be efficacious. If the convulsions are already developed, the child should smell *Ignatia*, by holding the cork of the bottle under the nose, during inspiration; if there is a second similar attack, the same means should be repeated, and if then they do not cease we should give *Cham.*, in water, a teaspoonful after every attack. *Bell.*, will suit in case of a failure of *Ignatia* and *Cham.*, and it should be preferred when the child after an attack falls into a lethargic sleep which lasts during the whole interval of calm; if he awakes suddenly as by a fright, looks anxiously around him, with the pupils dilated, and the eyes motionless as if he was frightened at something; when there was rigidity of the whole body, burning heat in the forehead and hands, passes his urine in bed (in these cases we may also recommend *Cina*); *Cina* will suit especially when the passing of urine in the bed is often repeated, even in the intervals of the attack, if he has a dry cough like whooping cough, to which are added spasms in the chest and convulsions, if the child thrusts the fingers in the nose." (Homœopathic Manual of Obstetrics, p. 142.)

The following indications are taken mainly from Guernsey's collection, and should be carefully consulted and compared with each other and with the *materia medica*. Consult also, Indigestion, etc.

Aconite is indicated when there is nervous erythism, constant restlessness, as from distress which no change of posture or circumstance seem to relieve. The child gnaws at its fingers or fists or something else; cries, whines or frets much of the time. Its sleep is very much broken, and there is usually much heat about the head, and a dry skin, sometimes with cold hands and feet. Soon after, or whilst waking from sleep, its cries of discomfort recommence. Accompany-

ing this state of things, sometimes there is constipation, when the stools are hard and difficult to evacuate; more commonly there is diarrhoea, when the stools are watery and dark colored, or bloody and slimy. The child is usually very thirsty, and seems to be relieved very much by holding on to the cup containing cold water, with its mouth, apparently for the purpose of cooling its gums.

Antimonium crud. is called for when the stomach so sympathizes as to present prominent symptoms. *Tongue white; much vomiting; no thirst.* Stools composed of hard lumps and watery secretions, passing together.

Apis mel. in flabby children when there are cerebral symptoms. Child screams out suddenly and sharply during sleep, more usually occurring at night. If now the child can talk, and is asked what is the matter, or what hurts it, the reply generally is, "Nothing." The urine is mostly scanty, but sometimes very profuse. Sometimes there is prolonged constipation, more frequently *diarrhoea*. Red spots scattered here and there over the skin, often causing itching and restlessness; worse at night. The gum covering the developing teeth sometimes has the appearance of a watery infusion or of a sac containing water.

Arsenicum alb. children are thin, pale, acid, restless. The child has a waxen look and very weak, has undigested, fetid stools, and emaciated; dry and shriveled skin; particularly restless *after* twelve at night. Child has paroxysms of anguish day and night, during which it often strikes its face or head with its little hand, as though that afforded relief. It often vomits all fluids *soon* after swallowing them, particularly water. It will only take a sip or two of water at a time, but very often it wants cold drinks. The gum over the advancing tooth sometimes appears to be blistered, or to be filled with a dark, watery fluid. The whole scalp is occasionally covered with a dry, scaly, milk crust, and the stools are of a light color. Sometimes the child has a very pale and waxy look, and is very weak. If constipation exists, it does not positively contra-indicate *Arsenicum*.

Belladonna.—Active children. The child moans a great deal, as though the moaning caused partial relief of suffering. Violent starting or jumping of parts or of the whole body, whilst sleeping or waking. If the startings occur during its waking hours it seemed frightened at them, or it awakens from its sleep frightened with one of these starts. Convulsions, followed by a very sound sleep. Face and eyes red, often with dilated pupils and heat of head. Awakens

from sleep with fright and staring eyes. The skin is often very hot, so as to leave a sensation of burning to the palm of the hand when removed from its surface. Aggravation every afternoon. Very hot fever at night, often lasting all night, with delirium. The stools are often composed of thin, green mucous of sour odor, and the child is often seen to shudder during stool. Sometimes the same kind of stool is involuntary. The gums are sometimes marked by numerous turgid blood vessels. The pupils are dilated and sensitiv to light. Worse after lying down in the evening.

Borax.—The child is evidently afraid of a downward motion, even during sleep. If the nurse attempts to lower it from her arms in a sleeping state, it is sure to cry out and to throw up its hands as if from fear. It is very sensitive to the least noise, such as the rumpling of paper, of a silk dress, or the click of a door latch, etc. Whilst sleeping it will sometimes start, cry out and hold onto things — its nurse, for instance, or the sides of the cradle or crib, as though it were afraid of falling. Stools watery, yellow, green or brown. Aphthous condition of the gums, and so sensitive as to shrink from the least touch, even of the nipple when hungry, in many cases.

Bryonia is called for when there is dry, parched lips, dry mouth and constipation, the stools being dark and dry, as if burnt. The child wishes to be kept very quiet, and seems to dread to be moved. If it be raised to the perpendicular it often vomits, seems faint, and wishes to be back again. Vomits its nourishment soon after taking it, unchanged (also *Ethusa*.) It seems eager for cold water, which seems to be preferred to its usual aliment. The swollen gums are hot and dry, though pale or light red.

Calcarea carb..—The child has large open fontanelles. The head perspires during sleep, so as to wet the pillow far around. Stools large, hard and of a chalky appearance, or thin and whitish. The gums are often pale and shiny when the tooth is a long time coming through. The child's feet are often cold and damp. The abdomen is, in some cases, large, and cold tumors are found about the neck. Loose rattling cough; soft and flabby muscles. Hydrocephalus sometimes threatens.

Calcarea phos..—Peevish and fretful children. Often screaming and grasping with the hands. Fontanelles still open, or had closed and reopened, most in the vertex. Cold sweat on the face ; body cold. They cannot hold the head up ; move it from place to place ; head totters. Squinting, as it were from pressure ; eyeballs seem distended ;

they protrude somewhat. *Coryza*, running in a cool room, stopped in warm air and out of doors. Ears cold; point of the nose cold. Swollen under lip; face pale, sallow, yellowish; gets hot, with other complaints. During dentition, diarrhoea with much wind. Greenish, thin stools. Children refuse the mother's breast; the milk has a saltish taste. Children lose flesh; weak, will not stand; do not learn to walk. Backward in teething, also in closing of fontanelles. Skull soft and thin; crackling noise, like paper; crepititation when pressed, most on the occiput—*Craniotabes*. (Hering.)

Causticum.—Children with delicate skin, when, during the evolution of a group of teeth, intertrigo makes its appearance, with occasional convulsions. Prolonged constipation; stools tough, covered with mucus, and shine like grease. The child has a yellowish, sickly looking face; ravenous hunger, and takes its food in a hurried manner; frequent gulping up of the watery portion of its nourishment. "Pot belly." The swollen gum sometimes suppurates.

Chamomilla.—Children have peripheral hyperæsthesia. The child starts and jumps during sleep. When awake it must be carried all the time, in order to soothe its sufferings. Sometimes it will sleep only whilst being carried in the arms. One red cheek, the other pale. Diarrhoea, watery and slimy, or like chopped eggs and spinach. Stools the odor of decayed eggs. Dry hacking cough. Very thirsty; likes to hold its mouth in cold water a long time when drinking. The appetite not as good as usual, and there is frequent vomiting of thin, sour milk. Gums red and tender; much sleeplessness. Compare with *Belladonna* and *Coffea*.

Cicuta virosa.—Grinding of the teeth (when they are through the gums), with pressing of the jaws together, like lockjaw. Convulsions with limbs relaxed and hanging down, or unnaturally stiffened and extended. (Williamson) Meningeal Symptoms.

Cina.—The child rubs its nose much and is unusually hungry. Very restless in its sleep; must be kept in motion nearly all the time by rocking or otherwise. Hacking cough followed immediately by an effort to swallow something. Diarrhoea; stools occurring immediately after drinking. Child wants many things which are rejected immediately or very soon after being offered them. Even its most choice playthings or articles of food are repelled with violence. It does not like to be looked at, or spoken to, or even touched; in fact, it is a very peevish child. Its urine soon turns white like milk, (phosphatic.) Restless at night; frequent crying out as from colicky pains, and calling for water.

- *Coffea cruda*.—The child is very excitable and sleepless ; it seems as if it *could not* sleep. It frets and worries in an innocent manner ; is not cross but sleepless. It laughs one moment and cries the next ; is feverish for want of sleep, which it cannot obtain. Controlled a case that had slept but little for four nights and days.

Colocynthis.—When the bowels sympathize particularly ; much colic, forcing child to double up, with writhing and twisting. Stools watery, frothy or bloody, with pain, which seems to contract or double abdomen up. Sometimes the pain is relieved by pressing hard upon the abdomen. Flatulent colic.

Creosote.—In this we have an invaluable remedy in difficult dentition, very painful dentition. The sufferings are usually aggravated at 6 P. M., and continue till near 6 A. M. During all this time, by rubbing and patting, and tossing, and worrying with the child, a very few short naps are obtained. It is a little more comfortable during the day, but the same scene is enacted the following night. The protruding gums seems infiltrated with a dark, watery fluid. Such teeth as are through the gums, are dark and show specks of decay down to the gums. Constipation is more frequent ; stools hard and dry. When there is diarrhoea the stools are dark brown and watery, and very offensive ; odor rather cadaverous. The stools seem to be exhausting ; they excoriate and sometimes contain portions of undigested food. In such cases we need not despair of so changing the morbid condition of the system, as that other teeth shall not turn black and decay. (See Salivation, p. 228.)

Cuprum acet. or met..—Dryness of the mouth, with colicky pains in the bowels. Green, bloody, painful stools, and efforts to vomit. Convulsions, beginning with cramps in the lower extremities, and drawing in of the fingers and toes, with much throwing about of the limbs, frothing at the mouth, and choking in the throat. (Williamson.) Spasms preceded by violent vomiting of mucous. After one spasm the child screams, turns and twists till another spasm occurs. All trouble seems inclined to be translated to the brain, threatening that organ with paralysis or dropsy.

Dulcamara.—The aggravations of dentition are all increased by every damp, cold change of weather. Not so much that the child takes cold then, but that the morbid condition of the child is such as to be influenced by that atmospherical change, upon the same principle as that the pains of *Rhododendron* are all aggravated by a storm of

wind, although the patient be warm and in bed. If the child be inclined to salivation, diarrhoea, eruptions on the skin.

Ferrum.—When a persistent diarrhoea is the result of morbid dentition. Stools composed of mucus and undigested food; sometimes excoriating and exhausting, though painless. The face is often flushed, or has a red spot on each side. (Compare *Cham.*) Often vomits its nourishment soon after taking it. Dentition advances slowly.

Graphites.—When the scalp, face, behind the ears or other portions of the surface becomes the seat of an eruption which oozes a clear, glutinous, watery fluid. Sometimes the whole scalp, face, behind the ears or such other parts as may be affected, becomes one complete raw surface, constantly pouring out this peculiar fluid. At the evolution of each group of teeth, this condition becomes aggravated. Often a severe constipation, of large, difficult stools attend the above condition. Sometimes the affected parts itch severely.

Helleborus niger.—When brain symptoms are being developed. Dilated pupils, drowsiness, particularly when the stools are white and jelly-like. (Compare *Belladonna*, *Hyoscyamus*, *Stramonium* and *Apis*.)

Hepar sulphuris calcis.—When a dry herpetic eruption is developed on some parts of the skin. It often appears in the bend of the forearm, upon the arm, in the popliteal spaces, upon the face and scalp. The itching is very troublesome. A whitish, sour smelling diarrhoea often attends. Aggravations occur at the approach of every fresh group of teeth. The gums are sometimes ulcerated, very tender and apparently very painful.

Hyoscyamus.—Pressing of the gums together, with putting the hands to the jaws, putting the fingers into the mouth, and other indications of pain in the jaws. Difficulty in swallowing. Convulsions, beginning with twitching of the muscles of the face, especially about the eyes. Dilatation of the pupils. Dark colored, bloated appearance of the face, and deep sleep after the spasm goes off. (Williamson.)

Ignatia.—The child awakens from sleep with piercing cries, and trembles all over. Convulsive jerks of single parts. Frequent flushes of heat, with perspiration. Spasms return at the same hours daily, with trembling all over. Spasms with cries of involuntary laughter. Stools usually of mucus or of bloody mucus, often attended with undue exertion and prolapsus of the rectum. Sometimes there is tenesmus and prolapse without stool. The child has much sighing, sobbing and crying; sighing and sobbing continue long after the crying.

Ipecacuanha.—Continual nausea, with occasional vomiting. Diarrhoea. Stools fermented and of many colors, or green as grass. Face pale with blueness about the eyes. More frequently useful, if to the above, a variety of catarrhal symptoms are added by cold.

Lachesis.—The child awakens in an unhappy mood, and often in a distressed condition. At times convulsions occur so sure as the child goes to sleep. If we watch such children attentively, we will perceive the breathing to cease just prior to the convulsions. The protruding gum is sometimes found to be dark purple.

Lycopodium.—The child sleeps with its eyes partly open, throwing its head from side to side, with moaning. It cries and screams just previous to passing water. Red sand or a reddish stain is perceived on its diaper after passing water. Much rumbling, rattling and commotion in the abdomen. If it passes flatus it is very offensive. Aggravation occurs at 4 P. M., and relief at eight or nine. Often very restless all night, like a *Rhus* restlessness. It takes but a small portion of food at a time, and does not care much for that.

Magnesia carb..—The teeth do not come through. A green and sour smelling diarrhoea has continued a long time. Emaciation. Sometimes the stools have the appearance of scum on a frog pond. Frequent vomiting of sour substances. Sometimes there is loss of appetite and sour breath, with constipation and frequent urging to evacuate a natural looking stool. (Compare *Rheum.*)

Magnesia mur..—Slow dentition, with distention of the abdomen and constipation. The region of the liver is enlarged and hard, and the nurse or mother says, "the child is liver grown." The stool is often large and hard, and crumbles as it leaves the verge of the anus. Sometimes the stool is green and pap-like.

Mercurius sol.—Copious salivation, and sometimes little blisters are seen on the tongue, gums and cheeks. Quite large ulcers sometimes are seen on the protruding gum. With the above conditions the nights are usually very troublesome. Now it occasionally happens that the child takes cold and the salivation becomes arrested, then convulsions occur. The diaper is often stained with a yellowish, strong smelling urine. Abdomen often hard and distended. Stools usually slimy, bloody, green and accompanied with tenesmus. A single dose of *Merc.*, is often sufficient.

Nux vomica.—For teething children being raised by artificial or mixed feeding, or whose mothers or nurses indulge constantly in highly seasoned food, wines, etc. Aggravations occur at about four

in the morning. Appetite becomes impaired, thirst increases and the child becomes peevish and fretful. Constipation with large, difficult stools, occurs, or the stools become small, frequent, lumpy or fluid. Bloody saliva often stains their pillows when sleeping. The mouth sometimes becomes sore and the breath very offensive.

Nux moschata.— Particularly when the stools are very thin and yellow, soaking into the diaper as it were. They are very exhausting, and the child is very sleepy.

Podophyllum.— Grinding of such teeth as are already out, with crying and worrying, often with painful diarrhoea. Rolling of the head from side to side, with green stools. Whitish, chalk-like stools, very offensive, with frequent gagging and thirst. Morning diarrhoea. Frothy undigested stools. Prolapse of the rectum with every stool. Sometimes the stools are very frequent all day, all of which are natural. Very worrying and sleepless all the early part of the night, apparently from nervous irritability. Voracious appetite, with other bad symptoms. Diarrhoea immediately after eating or drinking. Food sours soon after eating, when it is rejected. "Gagging, and the discharge of fetid, carrion-like smelling stools. The motion of gagging is made with the mouth, and not accompanied with the effort in the stomach seen in retching." (Williamson.)

Psoricum.— These cases at first view resemble *Sulphur*. On examining more carefully, if we find a dark fluid stool having the smell of decayed eggs, and eructations, or the child's breath having a similar odor, we may feel very sure that *Psoricum* is the remedy.

Rheum.— Child smells sour. Is particularly indicated when a very sour smelling diarrhoea is developed, with much pain in the abdomen during stool. The diarrhoea is aggravated by moving about. (Compare *Magnesia carb.*)

Sepia.— Dry ring worms make their appearance, or seem to brighten up at the evolution of every fresh group of teeth. Bad smell from the mouth. Aggravation of diarrhoea after taking *boiled* milk. The diarrhoea appears to be very exhaustive.

Silicea.— In scrofulous children having worms, with profuse salivation. Frequent pulling at the gums. Fever toward evening and all night, with heat in the head. Difficult stools. The mother or nurse declares, from observation, that the stool frequently recedes before the child can effect its passage. The feet smell badly, notwithstanding every effort to prevent it. Profuse sour smelling perspiration upon the head in the evening. Fontanelles are large, and the head is

larger in proportion than the rest of the body. The protruding gum is sensitive and seems blistered. Stools when very loose, are usually very dark, and sometimes very offensive.

Stannum.—In some cases where it seems as if *Cina* should cure and it does not. Particularly if the child is more comfortable by lying with its abdomen across some hard substance, the shoulder or knee for instance. Epileptiform convulsions, with clenching of its thumbs. (*Bell.*) If hernia should protrude, with *Stann.* symptoms, this circumstance would strengthen its indication.

Staphysagria.—The child is very sensitive to the least impression, whether mental or physical. It winces and shrinks from every wry look or harsh word, and cries from the least pain. The gums have a pale white appearance, and are very tender to the touch. Pot-bellied children. Frequent desire for stool, not relieved even by free evacuation. Such teeth as are cut have a dark look or dark streaks run through them. (*Kreosote.*) Moist scald head, with yellow scabs and very offensive. (Compare *Graphites* and *Viola tri.*)

Stramonium.—When the child's brain seems to be affected as to cause it to cease making its wants known except by motions. Violent grindings of such teeth as are cut. It seems to shrink from the sight of objects when first presented, as if afraid. The approach of a bright light causes spasms. Blackish, thin stools, having a cadaverous odor. A very dry mouth or a profuse salivation. "Grinding of the teeth. Moving of the fingers in sleep, as if searching for something. Disposition to stammer and try to talk. Often there is a desire for more light, and at other times light brings on an aggravation, and even convulsions. Convulsions, with cries as if from the sight of hideous objects. Much throwing about of the limbs, especially of the arms and hands, with motions of the fingers. The motions are most violent in the upper part of the body." (Williamson.)

Sulphur.—Dirty yellow impoverished child. White sour diarrhoea, with redness about the anus. Green or bloody stools, with crying and worrying, and rawness about the anus. Frequent vomiting of nourishment. Papulous eruptions on the skin, with much itching. The child does not like to be washed any more. Very tender and red about the anus after every stool. It takes no more long refreshing sleep. Frequent waking; wide awake; jumps in its sleep. Seems to have frequent weak and faint spells.

Sulphuric acid.—The mouth and gums in an aphthous condition, and seem very painful. The child is very irritable, restless and cries

much of the time. The stools are peculiar, the appearance being like chapped mucous of a saffron color. Even if there is no aphthæ, the stools are sufficiently characteristic, and may be regarded as the keynote when present.

Veratrum alb.—Vomiting, with severe retching; severe retching without vomiting. Cold sweat on the forehead. Vomiting renewed by the least motion. Diarrhœa. Each stool followed by great prostration. Cold, damp feeling of the extremities in spite of all covering and wrapping. Very weak, faint pulse. The above conditions simulate cholera infantum, but difficult dentition may be the cause.

Lancing the Gums is at times necessary when the tooth crowds the tough, unyielding tissue up until the tension seems to unnerve the child, although it doubtless could worry along until absorption takes place, still, it seems to the author that the promptings of humanity would urge the physician to incise the tough gum, and thus relieve the child at once. In tardy dentition more attention should be given to the digestion than to the teeth.

DISEASES OF THE TONSILS AND OESOPHAGUS.

THE TONSILS.

These glands, situated on both sides of the pharynx, and lying between the pillars of the fauces, are very often the seat of inflammatory disorders, simple in tonsillitis or quinsy, or complicated, as when they participate in constitutional diseases, such as diphtheria, scarlet fever, etc. In this section however, ample hypertrophy and inflammatory enlargement will only be touched upon.

HYPERSTROPHY OF THE TONSILS.

The signs of this affection are hardness of hearing, produced by occlusion of the mouth of the eustachian tube; a perpetual snoring during sleep, together with a constantly open mouth and a snuffling voice, will suffice to draw attention to the throat, where the tonsils will be found greatly enlarged and pressing upward and forward upon the palate. There is no redness, pain, or other symptoms in addition to the above. It would seem to be the result of a constitutional state rather than a local affection, and the treatment should therefore be general in its character rather than local.

TONSILLITIS.

This disease begins with difficult deglutition, pain, heat and dryness of the throat. The affected tonsil becomes enlarged, and may be felt externally beneath the lower jaw, as a small tumor; the voice becomes snuffling, the pain radiates toward the ear, and as the result of the upward pressure of the posterior pillar of the fauces, the passage leading to the pharyngeal opening of the eustachian tube may become mechanically closed, inducing hardness of hearing and tinnitus aurium. The soft palate is also reddened, and the highly inflamed tonsils are covered with a thick tenacious mucus.

Within a variable period of three or four days, pus is formed in considerable quantity in the organ, which may discharge itself spontaneously, or require the insertion of the lancet for its evacuation, the former termination being the most common. Should suppuration not take place, the tonsil will pass over into a chronic state of enlargement and induration.

Treatment.—For chronic induration of the tonsils, *Baryta carb.*, *Calcarea*, *Sulphur*, *Ignatia*, *Calc. iod.*, *Iodide of Arsenic*. Dr. Pearson says: "they are a great nuisance, and the cure is of slow growth, but *Sulph.*, *Lach.*, *Baryta c.* or *Apis* are the best remedies for the left side, and *Lyc.*, *Spongia*, or *Bell.* for the right, none of them below the 200th, and when no acute inflammation is present, should only be repeated at long intervals." This is essentially a glandular disease, and will be more fully treated under "Diseases of the Lymphatic System."

For inflammatory swellings threatening suppuration, *Belladonna*, *Aconite*, *Hepar*, *Mercurius*, *Lachesis* or *Kali bichromicum*. Jahr adds *Ignatia*, *Nux vom.*, *Sulphur*. The following remedies may also be indicated: *Nitric acid*, *Baryta*, *Lycopodium*, *Sepia*.

RETRO-PHARYNGEAL ABSCESS.

These may result, (1), from such as develop themselves idiopathically from an inflammation of the pharynx and the surrounding cellular tissue; (2), from the suppuration of inflamed cervical glands, and (3) such as are complicated with caries of the cervical vertebrae. In all these forms the first symptom is always a slowly increasing pain on swallowing, to which a certain amount of stiffness of the neck, in the motions of the head, without any externally perceptible diseased condition of this part, soon becomes superadded. The voice assumes a snuffling tone, and on examining the mouth the pharyngeal space is found constricted, the posterior wall of the pharynx not equi-distant on both sides from the soft palate, and of a livid color. As the disease advances, the stiffness grows more marked, the head is bent backward, and dyspnoea appears whenever the chin is made to touch the sternum. The neck, in the region of the angle of the lower jaw, becomes slightly thicker. Fever and restlessness supervene, and increase from day to day, with the growth of the abscess. In the highest grade of this evil, children are totally unable to swallow, breathe laboriously, with painfully distorted features. The respirations are loud, stertorous, but not whistling, as in croup; for which, at sight, the disease might be mistaken, especially as here, too, the speech becomes indistinct and the voice tuneless. The mouth is constantly full of mucus, and finally the posterior pharyngeal wall, on touching, fluctuates distinctly. When it extends deeply downward, even the os hyoid and larynx will be pushed forward, or to one side, and when at last it is opened, a large quantity of matter will flow out with a gush, followed by an instantaneous remission of all the phe-

nomena; spontaneous bursting of the abscess during sleep is said to have caused death by suffocation, the pus filling up the larynx.

In the second form, following upon suppuration of the cervical glands, enlarged or suppurating lymphatics will be found upon the neck; and in the third, the most frequent kind, the preceding signs of disease of the cervical vertebrae for many months, such as pain and difficulty on rotating and bending the head backwards, drawing upward of the shoulders, and hypertrophy, or alterations in form, of the affected vertebrae, may be observed.

The prognosis is always doubtful, but when caries of the vertebrae are present, it leads almost always to a fatal issue.

Treatment.—*Belladonna* has been the chief remedy in the hands of the author, where the first form of this disease has threatened. *Kali-bich.*, may be indicated in other cases. This form seems to make its appearance periodically and epidemically, and the epidemic remedy will be usually all-sufficient. If, however, due to necrosis of the vertebrae, *Hepar*, *Merc.*, or *Silicea*, will be indicated. Other remedies may be needed where the lymphatic system is involved.

Raue says, "The main remedies are *Hepar*, *Silicea*. In the attempt to swallow fluids they regurgitate through the nose: *Aurum*, *Belladonna*, *Lachesis*, *Lycopodium*, *Mercurius*, *Nitric acid*, *Phosphorus*."

THE OESOPHAGUS.

The diseases of this organ are rare among children, and are with difficulty diagnosed. They may be congenital or acquired, the most common of the former being œsophageal fistula. This may be uni or bilateral, and is generally found as a narrow canal permitting only the passage of a fine probe, which opens upon the side of the neck, about half or three-quarters of an inch above and behind the sternoclavicular joint. It may end as a blind cul-de-sac, or open into the pharynx, or somewhat lower down into the œsophagus. In chewing and swallowing there issues from it a viscid, mucous secretion, sometimes purulent, and an attack of coughing may force air through, with an audible noise. It is due to the non-closure of the third branchial arch at an early period of foetal life, is often hereditary in certain families, and is almost always incurable.

The acquired diseases of the œsophagus are those common to mucous membranes elsewhere, viz.: Hyperæmia, inflammation and ulceration.

Hyperæmia is rarely a primary affection, and occurs mostly in disorders of the digestive functions, and during the course of zymotic dis-

eases. It may be limited to certain sections or pervade the whole tract, and it may vary in intensity from a slightly increased redness to a deep, dark color. Slight ecchymoses may take place, varying in size from a pin's point to a linseed.

Inflammation of the oesophagus may be of croupo-diphtheritic, phlegmonous, or traumatic origin, in the latter case being generally the result of swallowing some caustic substance, or a foreign body, as a needle, fish or other bone. In cases of croupo-diphtheritis the exudation is found in isolated patches, or uniformly extending along the tube. The pustulous eruption of variola may produce inflammation of the oesophagus. In cases where caustic acids or alkalies have been swallowed, especially the latter, the mucous membrane and subjacent tissues are often destroyed to a considerable depth, and by the cicatricial contraction of the resulting ulceration, strictures of the oesophagus are formed. Burning, or lancinating pain occurs at some part of the oesophagus, in the neck, in the back, between the scapula, or in the praecordia. Deglutition is always painful, even the blandest fluid, the saliva itself does not pass down without pain. Retching or actual vomiting will take place according to the severity of the pain; deglutition is especially embarrassed in the dorsal decubitus, for when the head is thrown far backward, the anterior wall of the cervical column forms a convexity which protrudes into the fauces; on this account it is necessary to raise the head of a child whenever anything is administered to it. The thirst in oesophagitis is very tormenting, but for fear of the pain, children will refuse all drinks for days. Ulcers of the oesophagus have been met with as a result of the administration of large doses of tartar emetic in powder.

Treatment.—Against chemical burns, if they are of but recent occurrence, antidotes—acids against alkalies, and *vice versa*—must be administered, properly diluted. Subsequently emulsions are to be given, and to palliate the thirst, bits of ice are allowed to melt in the mouth, if the child obstinately refuses to swallow. To prevent the formation of strictures, the frequent passage of a bougie should be attempted.

The administration of *Aconite* will be found to be of very great service. *Arsenic* and *Rhus tox.* have been found very efficacious in oesophagitis.

Jahr says, "my first rule is to give *Rhus*, and if this is not sufficient *Arsenicum*."

For oesophagitis. Jahr gives, (1) *Arnica*, *Arsenicum*, *Belladonna*,

Coccus, Mercurius, Mezereum, Rhus tox. (2) *Assafœtida, Carbo veg., Euphorbium, Laurocerasus, Sabadilla, Secale.*

For spasms of the œsophagus the best remedies are *Coccus, Cuprum, Bell., and Hyos.* *Baptisia*, cannot swallow anything but liquids.

If due to acidity of the stomach, this must receive the first attention.

THERAPEUTIC HINTS.

Aconite, violent pain in the middle of the chest, through into the back ; worse from motion. When swallowing, it feels as though the food stayed lodged in the region of the heart ; lying on the back is impossible.

Arsenicum, dryness ; thirst ; anguish ; restlessness ; burning when swallowing ; food goes down only to the region of the larynx, when it is ejected again.

Belladonna, pressing pain, like contraction, and a feeling as though a foreign body had lodged fast in the œsophagus.

Kali bich., burning in the entire œsophagus ; solid food is painful and difficult to swallow, leaving a sensation as though something remained there.

Lachesis, the attempt to swallow solids causes a feeling as though something had gone the wrong way, bringing on violent gagging.

Mezereum, violent burning and soreness in the upper half of the œsophagus ; deglutition painful and difficult, especially after the abuse of *Mercury*.

Natr. mur., only fluids can be swallowed ; solid food reaches only a certain place, whence it is ejected with fearful gagging and suffocation ; hawking up of phlegm in the morning ; obstinate constipation.

Nitric acid in syphilitic persons.

Plumbum, fluids can be swallowed without difficulty ; solids come back into the mouth again. Some hours after eating, burning in stomach and œsophagus ; constipation ; prostration ; emaciation.

Belladonna, when too large a morsel or bone incites contraction of the œsophagus and keeps it fast. *Belladonna* generally relieves this spasm and lets the swallowed body down.

Cicuta, when, after swallowing a sharp piece of bone, the œsophagus closes, and there is danger of suffocation.

Hydrophobinum, periodical spasms of the œsophagus, with constant painful urging to swallow, but impossibility of doing it ; abhorrence

of fluids, especially of water ; burning, stinging in the throat ; cough ; gagging ; difficult and incorrect speech.

Hyos., spasmoidic contractions after a previous injury of the oesophagus ; solid and warm food can be swallowed best ; fluids cause spasms in the throat, stop respiration, talking ; hiccough, nausea, spasmoidic cough, and stiffness of the muscles of the neck.

For paralysis of the throat, compare Bar. c., Mur. ac., Causticum Con., Arsen., Calc. c., Hepar, Jod., Verat. (Raue.)

FOOD FOR INFANTS AND CHILDREN.

**HUMAN MILK AND ITS DIGESTION, CHANGES IN HUMAN MILK,
ANIMAL AND HUMAN MILK COMPARED, ARTIFICIAL
FOODS, FOOD FOR WEANED CHILDREN.**

Before we enter upon the study of the diseases of the stomach and intestines, we must consider the subject of food and digestion. The question of food for infants is one of the most important, as well as often one of the most difficult of solution. It is sometimes very difficult to tell whether the trouble is with the milk, or the child, or both. The general opinion is that mother's milk is the best for the infant, while the fact may be that it, or any other milk, may be the very worst possible. Why the milk combination is the best, the necessary food of the normal infant, is an interesting question. Water it needs in large quantities. Fat it needs for the enormous cell-activity. Fibrin or casein, (organized albumen,) is needed as a ferment, as well as to build up many parts of the growing system. Sugar is needed for transformation, to quicken necessary chemical changes, and the salts are wanted to hold these chemical mutations in check, as well as to divert them, and at the same time take part in the development of the intricate machinery of the young body. All these are needed by the infant, and must be present in its food for health; but the quantities of each present varies with the kind of milk, with the mother, and with the food of the milk-giver. While the proportions of each of the above ingredients vary under many conditions, and perhaps are never uniform, they must also vary with the needs of each infant, and particularly with the varying demands of the infantile system, first for fats, then for sugar, casein, salts, etc. What agrees with it is not always what it needs. If these facts are borne in mind, more success will result in the selection, or change of the food necessary, for each case we may be called upon to manage. If we would be successful in the management of children, we must see that they are properly nourished.

HUMAN MILK AND ITS DIGESTION.

It will aid us very much to select the proper milk or milk-food for a given case, if we understand the elaboration and composition of human milk and how it is digested..

The mammary gland is an aggregation of racemose glands which have numerous glandular vesicles, with an extensive surface of mucous membrane. The epithelium lining this membrane are loaded with fat, which exude, filling the glandular vesicles.

The changes in the mammary gland during pregnancy, in preparing to assume its proper functions, are first, an enlargement of the secreting surface, the vesicles become broader, and the ducts larger. In the interior fat vesicles appear, at first singly, and in the midst of cell-masses finally in such quantities that they fill and considerably dilate the sacculated terminal vesicle, and even press the epithelium to the wall. The interlobular connective tissue becomes looser, and encloses more fat.

Anatomically.—Milk resembles any other emulsified fat. It consists of myriads of little globules of fat (butter) floating in a clear liquid. On standing a few hours the largest oily particles rise to the surface as cream, the proportion of which is the test of quality. In cow's milk it should average about twelve per cent.

The fat corpuscles—anatomical elements of the milk—are unquestionably derived from the epithelium of the glandular vesicles, for the primary fat vesicles appear in the very middle of the epithelial mass, and the occurrence of globular cells, contain nuclei, and distended with fat vesicles, (colostrum), in the first milk after delivery. (Stricker's Histology, p. 580.)

Microscopically, (Frey, p. 553), milk consists of a translucent fluid, in which innumerable fatty globules are suspended; it is therefore an emulsion. These globules present the usual optical characters of oil-drops, and have an average diameter of .0023—.0090mm (about 1-12700 to the 1-3040 of an inch. Carpenter.)

The colostrum, the milk secreted the last days of pregnancy, and immediately after parturition, is quite different. It is of strong alkaline-reaction, rich in solid constituents and salts, and contains besides fatty globules, other bodies to which the name of colostrum corpuscles has been given. These are spherical structures of from 0.0151 to 0.0564 in diameter, consisting of an agglomeration of oil globules.

By the microscope alone, without the aid of chemical reagents, it is not possible for one to convince himself that the milk-globules have proper enveloping membranes. However, the presence of an enveloping membrane may be easily demonstrated, and, in fact, in two different ways. The one method, that of Henle, consists in the application of diluted acetic acid, and observing the acidulated milk under

the microscope. The milk-globules, in consequence, undergo such an alteration, that, if they were only minute oil-drops, they would never be capable of manifesting. They become very much distorted, some caudated, others biscuit-shaped; on most, however, a minute drop becomes visible, which appears almost like a granule of the milk globule; to this minute drop new ones become added on some places, so that around the now diminished milk-globule an entire circle of fine drops occasionally forms. By the application of concentrated acetic acid, the milk-globules fuse together into large drops. The second method is that of E. Mitscherlich, and consists in this: When fresh milk is agitated with ether, the milk remains unaltered, and the ether takes up only a small quantity of the fat. Were the milk a simple emulsion, it would surrender all its oil to the ether, and would itself be converted into a transparent, or at least a semi-transparent liquid; if some substance is now added which possesses the power of dissolving the enveloping membrane, for example caustic potash, or carbonate of the same, the ether then takes up all the oil, and an almost transparent liquid whey remains behind. (Vogel.)

Chemically.—In milk we find besides water, casein, neutral fats, sugar of milk, extractives, and mineral constituents, free carbonic acid and nitrogen gases, and small quantities of oxygen. (Hoppe.) Even blood, and bile pigment may be abnormally present. (Frey.)

Haidlen, (*Annalen du Chemie und Pharmacie*, xiv, 263,) from an analysis of cow's milk in the fresh state, deduces the following statement of its composition in 1000 parts, which we compare with the chemical composition of human milk, as compiled with M. Robin:

	Cow's Milk.	Human Milk, (Robin.)
Water	873.00	921.717 to 863.149
Milk-sugar	43.90 (lactine or lactose)	37.000 " 49.000
Albumen	00.00	traces " .880
Casein	48.20	29.000 " 39.000
Lactopeptine	00.00	1.000 " 2.770
Butter	30.00 (margarine)	17.000 " 25.940
Oliene	00.00	7.500 " 11.400
Butyrin, etc.	00.00	.500 " .700
Lactate of soda	00.00	.420 " 1.830
Calcium phosphate	2.31	2.310 " 3.440
Magnesium	0.42	.420 " .640
Sodium	00.00	.225 " .250
Iron	0.07	.032 " .070
Potassium chloride	1.44	1.440 " 1.830
Sodium chloride	0.24	.240 " .340

Sodium sulphate	00.00	-	-	-	.074 to	.075
Sodium, in combina-						
tion with caseine	0.42	-	-	-	.000 "	.000
Calcium carbonate	00.00	-	-	-	.069 "	.070
Sodium carbonate	00.00	-	-	-	.053 "	.056
					1000	

Water.—It will be seen that ninety per cent of some milk is water, while the best, richest milk contains eighty-five per cent. Water undergoes no change, and is in great demand in the infant organism, which consist of about eighty per cent of water. The adult body is made up of about sixty-eight per cent of water.

We get a better idea of the great value of water when we study the proportion in which it enters into each part of the human system, viz., the solids of the adult body contain water in the following proportion : The muscles contain 75 per cent., the bones 13, the cartilages 55, the teeth even 10, the ligaments 76.8, the brain 78.9 of water.

The fluids contain water as follows : The blood 79.5 per cent., bile 88, milk 88.7, pancreatic juice 90, urine 93.6, lymph 96, gastric juice 97.5, perspiration 98.6, and the first solvent of the food, saliva contains the enormous quantity of 99.5 per cent of water, or only one-half of one per cent of solid matter.

"The main bulk of the water taken in, does not simply pass through the bowels, but is taken up by the mucous membrane, and enters the circulating fluid. As it appears in the secretions it brings with it various ingredients. When it is finally discharged it is mingled in the urine and feces with salts and excrementitious matters, which it holds in solution, and in the cutaneous and pulmonary exhalations, with animal vapors and odoriferous materials of various kinds. In the perspiration it also contains mineral sulphates and chlorides, which it leaves behind on evaporation."* Water is also formed in small quantities in the body. (How To Be Plump, p. 37.)

Children are like plants, they need much water ; they thrive best in moist climates, seasons and countries, e. g., Great Britain, Canada, Germany, etc.

Casein is the principal albuminous ingredient of milk. It is called casein because when solidified it forms the substance cheese. (Caseus.) It is not affected by a boiling temperature. Coagulated albumen acts in the same manner. The composition of caseine is C_{53.3}O_{22.6}N_{15.7}H_{7.1}S₁. "The substance to which the term casein was formerly applied, and which is so abundant in milk, has lately been shown (Kuhne

Physiolog. Chemie, 1868, pp. 175, 565.) to be only a combination of albumen with soda, the albumen playing the part of an acid." (Carpenter's Physiology, p. 83.) Frey says "It is probably an albuminate of potash." Modern physiologists class it as fibrin.

"Casein dissolves in weak solution of the alkalies and their carbonates, and is thrown down from solutions by acids; the precipitate is a compound of the acid and casein, and is soluble in excess of the acid." This is why there is so much acid in the stomach. "Casein is also soluble in some saline solutions, as common salt, sal ammoniac, and nitre. (Brande & Taylor's Chemistry.) Salt should therefore be always added to milk when it is difficult of digestion, i. e., is vomited or passed curdy.

Casein contains sulphur to the amount of 0.36 per cent, (Mulder,) but no phosphorus. The oxidation of the sulphur no doubt starts the chemical metamorphosis that occurs in the casein.

"Like albumen and fibrin, casein is dissolved by strong hydrochloric acid at a boiling temperature, forming a reddish, purple-colored solution." (Brande.)

The nitrogenous matter of milk consists almost entirely of casein, associated with a very small proportion of albumen. Owing to the relative quantity of these two substances, milk does not solidify on boiling, but becomes merely covered with a thin pellicle of coagulated albumen, the result of the oxidation of a part of the casein, the balance of the casein remaining liquid. The addition of any acid will precipitate the casein and curdle the milk. The casein composes the walls of the milk globules, and the acid attacks these, dissolves them and they become precipitated as curd.

If milk be allowed to remain exposed to the air at a moderately warm temperature, it curdles spontaneously, owing to the development of lactic acid, due to the transformation of its sugar. This acid attacks the cell walls, and the separated fibrin coagulates. The same change occurs instantaneously from electric disturbances, during a thunderstorm.

The action of the acids (hydrochloric and lactic), of the stomach, acts in the same manner, dissolving off the caseous envelopes, forming them into curds. The sugar is transformed into lactic acid, and thus, doubtless, greatly aids the digestion or solution of the casein.

Casein is the ferment that starts the change of sugar into lactic acid. If the casein is not again made soluble by the alkaline phosphates, or carbonates in the milk, it continues to act, now giving rise to butyric fermentation.

Fat is one of the most important ingredients in the milk. We have seen that the first milk is almost exclusively fat. The water-soaked child, after about three days of evaporation, is then saturated with milk-fat. Since birth, the skin has been losing its moisture, and the mucous membrane, from the current of blood upon it, has changed to a more thick and consistent membrane, ready for its double function of protection and absorption. Now down comes the current of fat, which in its emulsified state squeezes itself into all the cells of the body. The glands along the alimentary current swell and rapidly assume their functional size and activity.

This fat serves important functions in the processes of digestion, assimilation and nutrition. According to Lehmann, it is one of the most active agents in the metamorphosis of animal matter, and this is seen not merely in the solution of nitrogenous articles of food during digestion, but also in the conversion of nutrient plastic substances into cells and masses of fibre—connective tissue, which is the upward transformation of white blood, lymph, or fat corpuscles, with their casein or fibrous envelop.

Elasser long since observed that during the process of artificial digestion, the solution of nitrogenous food was considerably accelerated by means of fat; and Lehmann has since determined, by actual experiment on dogs, that albuminous substances deprived of the fat, remain longer in the stomach, and require more time for their metamorphosis than the same substances impregnated with fat.

"It is probable, indeed, that the digestive power of the pancreatic fluid is due, in a great measure, to the presence of fat; and that the subsequent chymification of food, and its absorption, is greatly assisted by it.

"There is also good reason for believing that it is largely concerned in the *formation of bile*, and that the biliary acids are conjugated fatty compounds. This may account for the well-known action of fat, bacon, etc., in promoting the secretion of bile." (Letheby.)

The digestive power of fat, as we have seen, is certainly considerable, and it is no less active in the subsequent conversion of nitrogenous matters into cells and tissues and their retrograde decay. Colorless blood corpuscles receive the first impulse of their formation from the metamorphosis of fat; and thus it is an important aid in the genesis of blood. It would appear from the latest investigations of physiologists that fat plays an equally important part in every kind of cell development. Acherson showed, as far back as 1840, that albumen

coagulates from its solution around a fat globule, and this is seen in the digestion of the little fatty particles of milk, which have an envelop like a cell wall, of consolidated casein. Hunefield, Nasse, and others, have further shown that the nucleoli of cells invariably consist of fat, and that recently formed plasma always contains more fat than the mature cell. This is one reason why infants need so much fat.

That fat, or some nearly allied principle, admits of the highest degree of organization of which matter is perhaps capable, is evident from the large proportion in which it enters into the nervous and cerebral tissues; *one-fourth*, at least, of the solid matters composing the brain and nervous system, is said to consist of oleaginous principles. With the fats are associated an unusually large proportion of phosphorus, and other incidental mineral matters.

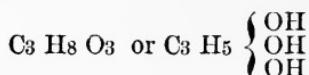
Fatty matters are digested by the emulsifying action of the pancreatic fluid; and by being thus broken up into extremely minute globules, they are freely admitted into the lacteal vessels; in fact, the emulsified globules of fat are seen covering the villi of the intestines, penetrating their tissues, pervading the subjacent cellular bodies, and thus entering the lacteals. From thence they enter into the lymphatic glands, through which they pass to the chyle duct, as lymph, or white blood corpuscles. They do not directly pass through the lymphatic glands, but swell the first cells, which crowd off the ones on the opposite side. (Letheby).

The conclusion is inevitable, therefore, that the milk-fat takes an active part in all the processes by which the nutrient constituents of food are converted into the solid substrata of organs. So energetic are its powers in this regard, that when the nitrogenous matters of the fluids are not in sufficient quantity to form cells with the fat, it borrows the material from muscular or other tissues, and thus produces a fatty degeneration of the part. This is observed in the muscular structures of over-fed animals. The same thing is observed where the food of the child is too rich, fatty, or where it is over fed, i. e. in the excessively alkaline. When the fat is not emulsified, it often becomes rancid, i. e., the fatty acids liberated, and are regurgitated. We should know its ultimate composition. The fatty matter of milk consists chiefly of palmatine and oleine, together with a small proportion of peculiar, oderiferous and flavoring ingredients, the principal of which has received the name of *butyrin*. These substances are, according to Dalton, usually mingled in the following proportions:

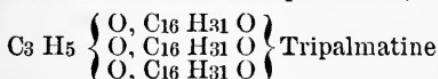
Palmatine,	- - - - -	68 parts.
Olein	- - - - -	30 "
Butyrin and other flavoring matters		2 "
		100

Butyrin yields in its saponification, three volatile acids, of strong, animal odor, to which Chevreul has given the names of butyric, caproic, and capric acids. These peculiar acids are not only formed when butyrin is treated with alkalies, but are produced by the ordinary decomposition of this principle, which is favored by time and moderate warmth. When this decomposition is hastened by feeble digestion, a change of diet will be necessary.

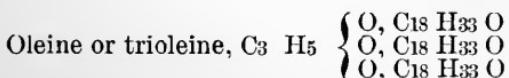
The neutral fats of the milk consist of the ordinary fatty matters, (palmatine, oleine, etc.,) with glycerine, which, on saponification, sets free butyric, capronic, caprylic and caprinic acids. (Frey.) Glycerine



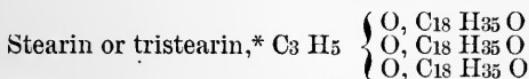
is the base of all the fats. Palmatine, or tripalmatine,



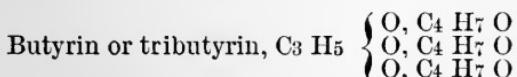
is a compound formed by palmitic acid, ($\text{C}_{16} \text{H}_{32} \text{O}_2$), and glycerine. Its melting point is 140° .



one of the most important constituents of the neutral fats of the body, is a combination of glycerine and oleic or elaidic acid ($\text{C}_{18} \text{H}_{34} \text{O}_2$).



a compound of glycerine and stearic acid, ($\text{C}_{18} \text{H}_{36} \text{O}_2$), is also a widespread constituent of the neutral fats of the human body. Its melting point is 156.2° .



is a constituent of neutral butter, fat being a union of glycerine and butyric acid. ($\text{C}_4 \text{H}_8 \text{O}_2$). The acid is set free by the fermentation of the hydrocarbons.

*To these may be added trimargarin, for it has been produced artificially.

Capronic, ($C_6 H_{12} O_2$), *Caprylic*, ($C_8 H_{16} O_2$), *Caprinic* ($C_{10} H_{20} O_4$), acids are met in a free state, with glycerine, as constituents of butter, and it is supposed, also, of the sweat. The rancid odor of perspiration, compared to old cheese, may be due to these acids.

Generally these acids enter into other combinations, the final result of which is carbonic acid and water. The various changes which the fats and fatty acids undergo constitute them of the highest importance as heat producers. This alone would account for their preponderance in the milk of those women living in cold countries.

Sugar of Milk is the next most important ingredient in the mother's milk. It will be seen that it stands next to the water in its proportion in the milk, being from 5 to 7 per cent.

The quantity varies, as will be seen in the analyses given by Carpenter, from 3.92 to 7 parts in 100. The proportion of sugar is greater in women of fair complexion, flabby muscles and sluggish muscular, rather than those of stronger constitutions. (Becquerel and Vernois.)

The quantity of sugar is also doubtless affected by climate. Condusau found the milk of an Esquimaux woman, suckling two infants at the Zoological garden, Paris, richer in sugar than the milk of the European woman.

The time that elapsed after parturition has a bearing upon the sugar. It is at its maximum at first, and gradually diminishes.

The function of sugar of milk is a very important one. Milk containing much sugar is easier of digestion than milk poor in sweets. The sugar of the milk swells the globules. In the same way it doubtless aids digestion and assimilation. Whatever may be the proper explanation, the presence of sweets very much aids the digestive process.

"The sugar of milk crystallizes from milk whey into four sided prisms, whose composition is $C_2 H_{10} O_10 + 5HO. O.$ "

"In many of its properties it bears a close resemblance to glucose or grape sugar, into which it is readily converted by the agency of dilute sulphuric or hydrochloric acid, or by acetic or citric acid."

"It is readily made to pass into the lactic or butyric fermentation by appropriate ferments, as casein and fat; but it is with difficulty brought to undergo the vinous fermentation."

Lactine differs from other sugars and resembles gums, as nitric acid produces with it oxalic, as well as mucic acid. It readily undergoes fermentation, the casein and albumen in milk being sufficient ferments. At a temperature of 104° the lactine of fresh milk is con-

verted into alcohol and carbonic acid, by the alcoholic fermentation, i. e., with nitrogenous matters. If exposed to the air a change is induced in the casein, by which lactic acid is produced, as a result of the lactic fermentation. The change in this case first takes place in the sugar by the decomposing casein, then the acid takes the chief part in the work of transformation.

Under other conditions the milk passes through the butyric fermentation, and butyric acid is a product. In other words, the fat becomes changed, and its chief acid takes the prominent part in the metamorphosis.

Lactic acid ($C_3 H_6 O_3$), so freely found in milk on the decomposition of its sugar, is a compound of considerable chemical and physiological interest, for it is related not only to the saccharine, but also to the oleaginous and albuminous groups. It may be obtained from the fermentation of milk sugar in the form of a colorless, syrupy fluid, of pure acid taste, but free from smell. It dissolves in all proportions in alcohol, ether and water. It is not volatile, and can therefore displace some of the strongest mineral acids, as the hydrochloric, at a high temperature; when still more strongly heated, it yields lactide, carbonic acid, and carbonic oxide gases. It is connected with the albuminous compounds, of which it is regarded as a product of retrogressive metamorphosis, through alanin, which is isomeric with sarcosin, a derivative of creatin. To the oleaginous compounds it is related by the similarity of its composition to propionic acid, which is the product of the oxidation of oleic acid, and it is thus associated with formic and butyric acids. It is found widely distributed through the tissues of the body, and is of almost constant occurrence in the various parenchymatous juices, especially in that of muscle, the proportion present being considerably increased after exercise. It appears to be rapidly decomposed in the blood (carbonic acid being left in combination with the bases), since a few moments after the introduction of considerable quantities of the alkaline lactates into the stomach, the urine is found to be alkaline from the presence of their carbonates. (Carpenter.)

The chief salts of milk consist, according to Robin's analysis, as we have seen, of phosphate of lime, magnesia, sodium, iron; chloride of potassium and sodium, sulphate of sodium, carbonate of sodium and calcium. They undergo very little change during digestion. We will glance at their functions in the body.

Among the inorganic matters and compounds found in the body, consequently in the milk, are the following:

(a). *Gases*.—Oxygen, nitrogen and carbonic acid. These are found either in the various cavities of the body, or diffused, or chemically combined in the various fluids.

(b). *Acids*.—Carbonic, phosphoric, sulphuric, hydrochloric, hydrofluoric and silicic. These, with the exception of the carbonic acid, diffused through the fluids, and hydrochloric acid, found free as a constituent of the gastric juice, hardly ever occur in a free state in the body, but almost invariably combined with bases.

(c). *Bases*.—Potash, soda, ammonia, lime, magnesia, oxides of iron, manganese and copper. These usually appear as salts, and yet we have free alkalies, especially soda combined with protein compounds, and also iron, in many animal substances, as, for instance, in haemoglobin and melanin. (Frey.)

In the earlier periods of foetal life, the ash only amounts to one per cent of the whole weight of the body; it rises later on to two, and reaches, in mature mammals, as high as 3.5, 4, or even 7 per cent. In advanced age, it is probable that this is still farther increased. (Bezold and Schlossberger.)

The saline matter in milk appears to be nearly identical with that of the blood; with a large proportion of the phosphates of lime and magnesia, which amount to 2 or $2\frac{1}{2}$ parts in 1000. These phosphates are held in solution chiefly by the casein, which seems to have the power of combining with them, even greater than that of albumen; the presence of a minute proportion of free alkali also assists their solution.

Lime phosphate.—(Ca₃P₄O₈).—This substance exists as an ingredient of all the animal solids and fluids, without exception, and so far as regards its mass, it is, next to water, the most important of the inorganic constituents of the body. It forms more than one-half of the substance of the bones. Of the fluids, it is the milk alone which contains lime phosphate in notable quantity, and here it is plainly subservient to the ossification of the growing bones of the infant. It is present in small amount in the circulating fluids, the internal secretions and the urine. It is deposited in the osseous or cartilaginous substance, not as a granular powder, but intimately united with the animal matter of the tissues. In the formation of the bony skeleton, during foetal life, infancy and childhood, the cartilaginous substance previously existing is replaced by osseous matter, which contains a large proportion of calcareous salts.

In the plasma of the blood the lime phosphate, though insoluble in

simple alkaline, watery liquids, is held in solution by its union with the albuminous ingredients. Fokker has shown that earthy phosphates, added to the white of egg, united with the albuminous matter, and became soluble in proportion. This explains the presence of lime phosphate in a liquid form, both in milk and in the blood, both fluids which have an alkaline reaction. In the urine it is held in solution by the acid sodium biphosphate. Accordingly, when the urine is rendered alkaline by the addition of soda or potassa, the earthy phosphates are precipitated in the form of a white turbidity. (Dalton).

Sodium chloride—(NaCl).—This is undoubtedly the most important of the mineral constituents of the body, so far as regards its general distribution, and the active part it takes in the internal phenomena of nutrition. It is the most abundant of all, next to the lime phosphates and is universally present in all the animal tissues and fluids. In the blood it is more abundant than all the other mineral ingredients taken together. The proportion in various parts of the body is as follows, (in 1000 parts): Bones, 7.02; urine, 5.5; lymph, 5; sebaceous matter, 5; blood, 3.36; bile, 3.18; perspiration, 2.23; gastric juice, 1.70; saliva, 1.53, and in milk, only .30. One of the most important characters of this salt in the living body, is undoubtedly its property of regulating the transudation of nutritive fluids through the organic membranes. This property is shown more or less by the other mineral ingredients of the blood. The proportion of salt in the blood undergoes little variation whether little or much is taken. If the latter, it is quickly carried off by the kidneys, if deficient none is eliminated.

By conferring in association with other salts, a certain density upon the blood plasma, it plays an important part in the conservation of the morphological elements of the blood, in their natural condition. (Carpenter.)

The necessity for chlorine to form the hydrochloric acid of the gastric juice, and for soda to form bile, shows at a glance the importance of chloride of sodium to the system. The greater amount of this salt in animal food compared with vegetable food, and the great demand for it by herbivorous animals, proves its necessity for children when they begin to eat starchy food.

This agent has a marked effect upon the solution of the casein, (fibrin) of the milk, and should be added where the milk is vomited, or passed in curds.

It increases the flow of urine, and should be added to the food in cases where the urine is voided in large quantities.

Sodium and Potassium Carbonates.—(Na_2CO_3 and K_2CO_3) are associated with the phosphates in all of the more important fluids of the body. The alkaline carbonates are readily soluble, and assist in producing the necessary alkalinity of the blood and secretions. They are introduced by the food and are also formed in the body. In excess they render the urine turbid and alkaline.

Sodium and Potassium Sulphates.—(Na_2SO_4 and K_2SO_4)—Constant ingredients of the body, they must also exist in the milk. They are present in small quantities compared with other saline matters. They are most abundant in the urine. Besides being introduced by the food they are formed in the body during decomposition of albuminous matters by oxidation of their sulphur. Sulphuric acid thus generated unites at once with the alkaline bases, displacing the weaker acids with which they were previously combined, and thus contributes indirectly to the general acid reaction of the excreted fluids. This transformation of albumen takes place in the stomach, and would give rise to many important changes in the blood and nutrition.

Lime Carbonate,—(CaCO_3)—is to be found in the bones, etc., associated with the lime phosphate. In the fluids, it is soluble by the alkaline chlorides, or by free carbonic acid.

Magnesian phosphates,—(MgHPO_4), like the lime phosphate, is found in all parts of the human body. It preponderates in the muscles and especially in the brain, and should be present in the milk.

Sodium and potassium phosphates,—(Na_2HPO_4 and K_2HPO_4),—associated under the name of earthy phosphates, are of the greatest importance as ingredients of the body, and consequently of the food. Readily soluble in water, they add alkalinity to this fluid, and to the system—a condition of the body so necessary to the development of a healthy child. The alkalinity of the blood is due, in a great measure, to the alkaline phosphates. They preponderate in animal food, while the alkaline carbonates preponderate in vegetable food. The alkaline phosphates exist in both, and after performing their functions in the system are excreted with the perspiration, mucus and urine.

Potassium chloride,—(KCl), is found accompanying the sodium chloride, many of the properties of which it shares, and with which it is closely related in its physiological characters. It is abundant in milk and the muscles, as we would expect, potassium being the chief nitrogenous ingredient. Like chloride of sodium, it has a neutral reaction, and by water is liquid in all the tissues of the body. Injected into the circulation it paralyzes the heart, but taken into the stom-

ach it increases the frequency and force of the heart's action, and the pressure of the blood. The effect of salt is doubtless similar, only in a less degree.

Iron, (Fe), like the alkaline salts, is an essential constituent of the blood, and is supplied by it to the various tissues, especially the muscles and hair.

Alkaline reaction is necessary to a large number of vital processes, and this reaction is present without exception in all the animal fluids which are actually contained in the circulatory system, or in the closed cavities of the body. An acid reaction is found in very few of the organic fluids which are employed either in the process of digestion, or are discharged externally.

The following list shows the comparative frequency of alkaline and acid reactions of the animal fluids. (Dalton):

Alkaline.—Blood plasma, lymph, aqueous humor, cephalo-rachidian fluid, synovia, fluids of the living muscular tissue, mucus in general, milk, saliva, tears, pancreatic juice, intestinal juice, spermatic fluid.

Acid.—Gastric juice, perspiration, mucus of vagina, urine.

If we take into account the carbonic acid exhaled with the breath, we see that the excretions present universally an acid reaction.

Of all the internal fluids, the most essential is the plasma of the blood, since it affords the materials for nutrition to the entire system; and its alkaline reaction, which is distinctly marked, is found to be invariably present, not only in the human subject, but also in every species of animal in which it has been examined. This reaction of the blood is necessary to life, since Bernard has shown (*Liquides de Organisme*, p. 412), that if an injection of diluted acetic or lactic acid be made into the veins of the living animal, death always results before the point of neutralization has been reached.

The alkalinity of the blood gives to it extraordinary capacity for dissolving carbonic acid. According to Leibig, water with one per cent of sodium phosphate is enabled to absorb and retain twice its usual proportion of carbonic acid; and the other alkaline salts, as is well known, have a similar dissolving action on this gas. Consequently the blood rapidly absorbs the carbonic acid which has been formed in the tissues, and incessantly carries it away to be eliminated by the lungs.

We see, therefore, that the salts of milk are chiefly alkaline. If we take into account the fact that the salts increase in the milk to supply the growing needs of the body of the child, we get an idea of their

great importance, and at the same time, the wise provision of nature.

CHANGES IN HUMAN MILK.

Having studied the composition of milk, its chemical changes and ultimate analysis and destination, we are prepared to note the changes in human milk. Every mother knows that her milk varies in quantity and quality. On its first appearance it is richer i. e., has more fat than afterwards; the first few months it is more watery; towards the time of weaning it becomes quite salt, while the salts are in excess. It not only changes thus from month to month but it changes with the food, as we shall see and also varies greatly in different women and in different countries. These facts should always be borne in mind when studying the food question. There are many points, however, that are as yet unexplained. These we hope will be solved shortly.

The proportion of the different constituents of milk is liable to great variation, from several causes. The milk of women of different temperaments will vary largely. Thus the whole amount of solid constituents may vary from 8.6 to 13.83 parts in 100; the difference being partly due to individual constitution, but in great part also to the amount and character of the food taken. The average seems to be ten or twelve parts of solid matter.

From the researches of M. M. Vernois and Becquerel, we find the richest milk is far from being secreted by women of the greatest muscular development. On the contrary, their investigations tend to show that a robust figure is inferior in milk producing power to one slighter and less apparently vigorous. The following table, formed after an analysis of sixty-three cases of the former, and twenty-three of the latter, will make this apparent.

Under the first head (strong constitutions), they place brunettes, with well developed muscles, fresh complexions, moderate plumpness, and all the other external signs of constitutional strength. Under the second head they range fair complexioned women, with light or red hair, flabby muscles, and sluggish muscular contraction.

	<i>Strong Constitution.</i>	<i>Weak Constitution.</i>	<i>Normal.</i>
Specific gravity.....	1032.97	1031.90	1032.67
Water.....	911.19	887.59	889.08
Solid parts.....	88.81	112.41	110.92
Sugar.....	32.55	48.88	43.64
Casein.....	28.98	39.21	39.24
Butter.....	25.96	28.78	26.66
Salts.....	1.32	1.54	1.38

It will thus be seen that in women ranked under the head of strong constitutions, the deficiency in the amount of the sugar and the casein is very remarkable, while in those of apparently weaker constitution, these elements very nearly attain the normal standard.

The following table from Carpenter (p. 977) will serve to indicate the usual composition, in 100 parts, as well as the ordinary variations occurring in mother's milk in different countries, etc.:

	<i>Toby and Finsol.</i>	<i>Bodeker.</i>	<i>Griffith.</i>	<i>Doyere.</i>	<i>Brunner.</i>	<i>Henry and Chevalier</i>	<i>Simon.</i>
Water.....	87.46	88.22	87.5	87.38	90.0	87.95	86.18—91.40
Sugar of Milk.....	6.8	6.46	6.176	7.00	6.2	6.5	3.92— 6.24
Fat (butter).....	4.75	0.1	2.514	3.88	1.73	3.55	8. — 5.40
Albumen, Casein, etc.09	1.9	1.268	1.64	.063	1.52	1.96— 4.50
Salts01	0.33	01.55	.018	1.40	.045	.16— .27

It appears from the analysis of Simon that the proportion of different ingredients is liable to variations, according to the time which has elapsed since parturition. The quantity of casein is at its minimum at the commencement of lactation, and then gradually rises until it attains a nearly fixed proportion. The quantity of sugar, on the contrary, is at its maximum at first, and gradually diminishes. The amount of butter, as appears in the comparative analysis, is more variable than that of any other constituent. Its amount depends upon the food and exercise taken.

Exercise and cold, by increasing the respiration, eliminate part of the oily matter in the form of carbonic acid and water; while rest and warmth, by diminishing this drain, favors its passage into the milk. The proportion of casein is increased by exercise.

Dr. Playfair's observations on the milk of the cow, corresponds to the common observation in Switzerland: Where the cows graze in exposed situations, and have to use much muscular exertion, they give but little butter, while the amount of cheese is unusually large. These same cattle, when stall-fed, give a large quantity of butter, and very little cheese. What is true in regard to the cow is doubtless true also in the case of the human milk. We have here a valuable hint on the management of our cases. If the child vomits, or passes curds, cries with colic, and gives other evidences of having much casein to contend with, we may improve the milk by keeping the mother quiet,

while if the milk is too rich, the child eructates or belches, or vomits up water, and "so sour," we may lessen the butter and increase the casein by ordering more exercise for the nurse.

Diminishes with Age.—The total amount of solid matter diminishes with age, being most abundant in nursing women of from fifteen to twenty years, and smallest in those of from thirty-five to forty years of age.

The so-called "*vital*" changes in the chemical composition of the milk, dependent on distinct disease, are especially to be dreaded when the mother is affected with consumption, syphilis, epilepsy, or chronic eruptions. When the mother has a flabby, lymphatic constitution, without actual disease, or when there is anaemia, i. e., impoverishment of the blood, induced by over-work, insufficient food, or prolonged lactation, the solid constituents of the milk are generally diminished. The milk of an anaemic woman, who had been bled several times during pregnancy, showed a marked diminution of casein and sugar, with an *increase of butter*. The large fat, colostrum corpuscles sometimes reappear when the mother suffers from exhausting disease. This latter fact is quite remarkable, and of importance, because the nutritive value of milk is generally estimated by the proportion of the fat alone. The fat in the milk is formed in the cells lining the ducts of the glands, from the casein and sugar. In many cases of perverted nutrition, an excess of albuminous and saccharine material is converted into fat, and it is possible that the excess of fat found in this analysis, was due to such morbid metamorphosis. In another anaemic woman, who had suffered from uterine haemorrhages, the casein, butter, and sugar were all diminished, together with some of the salts (phosphates). In other words, the milk was more watery — just as the blood is after haemorrhage. Both the children were rickety. In a third case, where the child was extremely rickety, and died on the fifty-third day, the sugar was in normal proportion, but the casein and butter were diminished, and there were only traces of earthy salts.

The water in excess, i. e., the solid constituents are diminished *en masse*, when the proportion of water in the blood is increased — thus, after haemorrhages, artificial bleeding, in some kidney diseases, and in some forms of anaemia. The milk is less nutritious because *watered*. *The water is diminished*, in forms of anaemia where the mass of blood is diminished; in very hot weather, causing excessive perspiration; in fevers; and during menstruation, if that occur in the period of

lactation. In the last case, the diminution depends on the derivation to the uterus of blood from the blood vessels of the mammary glands, thus diminishing the supply from which the water of the milk is to be transuded.

The quantity of caseine is, other things being equal, in inverse proportion to that of the water, and is therefore increased in all the above cases. During menstruation, the cells of the ducts which secrete the albumen, sugar, and salts from the blood, continue their function even when less water transudes from the blood vessels, and hence the solid ingredients of the milk increase out of proportion to the aqueous. The milk is said to be more concentrated, resembles cow's milk, and is digested with difficulty by the child, for the same reason as the latter. The quantity of casein may be readily estimated by curdling skimmed milk with acid, washing the curds repeatedly to free them from sugar and salts, drying and weighing the residue.

Deficiency of butter frequently occurs in poor, watery milk, found in the breasts of anaemic women, ill-fed, or debilitated from other causes. Yet, as we have seen, in some such cases, there is an excess of butter, in proportion to the other solid ingredients; but it is highly probable that then the butter is not of normal quality, but results from the fatty degeneration of the albuminous ingredients of the milk. Albumen is very liable to become converted into fat as a result of perverted nutrition, and in this way the muscles of the limbs, or the muscular fibre of the heart, becomes fatty or "suffers fatty degeneration." The same change may take place in the albumen of the milk.

The increase of salt in the milk increases with the age and functional activity of the child. It facilitates the streaming of nutritive fluids in and out of the cells, and the rapidity of metamorphosis of albuminous substances, so that the nutrition is everywhere quickened. But if this increase be excessive, the destruction of tissues will be also excessive; too much albumen will be thrown out of the tissues, and diarrhoea will be set up, in the effort to eliminate the effete matter, just as in starvation. In the "Journal for the Diseases of Children," (1873), is related a case where the mother's milk contained 8 per cent of salt, instead of .09 in a hundred parts, (the normal amount), and the baby nearly died of inanition and its attendant diarrhoea. It was only saved by the substitution of a wet nurse.

In rheumatic women, whose blood contains lactic acid, the milk is liable to be acidified. From this cause the baby will pine, to the great astonishment of the mother, who boasts of the abundance of her milk.

When fruits are carefully excluded from the diet, the bowels are very apt to become constipated ; their contents retained too long, ferment, and give rise to the fatty acids, which *do* pass into the blood, and out of it again in the breath, the secretions of the skin, and the milk. By them the breath may be rendered foul, the *skin greasy*, and the *milk really sour*, and become a cause of colic and indigestion to the baby. *Every kind of diet* that is known to *cause constipation* must therefore be scrupulously avoided by a nursing woman, while fruits, on the other hand, are extremely desirable as articles of food for her. *In hot weather*, when perspiration is abundant, it has been said that the proportion of water in the milk diminishes, and the milk becomes indigestible because too concentrated. It is then necessary to take *cooling drinks*, abundance of water, to replace that evaporating from the body, vegetable acids, or citrate of potassa, or even mineral acids, diluted into lemonade. *Citric acid*, (found in lemon juice) is changed into carbonic acid by taking up oxygen from the blood. Less oxygen is left, therefore, to oxidize or burn the tissues, and less heat is produced. *Mineral acids*, as the aromatic sulphuric, act in a different way. They are astringent, contract the blood-vessels of the skin, and thus diminish the amount of blood circulating on the surface, and the amount of water that can be transuded through the walls of the vessels, in perspiration. They diminish heat, by antagonizing the combustions going on in the blood, although they are not oxidized, but form salts with alkalies, and thus pass off in the urine. (Jacobi, Infant Diet.)

The colostrum of human milk, according to Bernard, contains a very large quantity of albumen, since it coagulates *en masse*, when heated. At a later period, none can be discovered by this method ; but if sulphate of magnesia be added, all the casein and the butter, (the corpuscles), will be thrown down, and on filtration will be left on the filter with the magnesia ; the filtrate will then contain the albumen and the sugar of milk, and will coagulate by heat. (Carpenter.)

"No secretion," says Carpenter, "so strongly manifests the influence of the nervous system, and especially of emotional states, both upon its quantity and quality, as that of the mammary glands. Although the production, when once established, continually goes on in the breasts of a nursing female, yet it is obviously accelerated in the first instance, and augmented afterwards, by the mechanical irritation of the nipple, produced by the suction of the infant; and this alone, (or in combination with the strong *desire to furnish milk*), has

been effectual in producing the secretion in girls and old women, and even in men. Again, in the nursing female, the secretion is often suddenly augmented by the *sight* of the infant, or even by the *thought* of him in absence, especially when associated with the idea of sucking ; this gives rise to the sudden rush of blood to the gland, which is known by nurses as the *draught*, and which may probably be attributed to a dilatation of the mammary arteries, through the instrumentality of their sympathetic nerves, analogous to that which takes place in the act of blushing. Although we are continually witnessing indications of the powerful influence of emotional states upon the qualities of the mammary secretion, yet it is probable that such influence is not at all peculiar to the milk ; and that we only recognize it more readily in this case, because the digestive system of the infant is a more delicate apparatus for testing it than any which the chemist can devise ; affording proof, by disorder of its function, of changes in the character of the secretion which no examination of its physical properties could detect. The following remarks on this subject are abridged from Sir A. Cooper's valuable work on the Breast : 'The secretion of milk proceeds best in a *tranquil state of mind*, and with a cheerful temper ; then the milk is regularly abundant, and agrees well with the child. On the contrary, a *fretful temper* lessens the quantity of milk, makes it thin and serous, and causes it to disturb the child's bowels, producing intestinal fever and much griping. *Fits of anger* produce a very irritating milk, followed by griping in the infant, with green stools. Grief has a great influence on lactation, and consequently upon the child. The loss of a near and dear relation, or a change of fortune, will often so much diminish the secretion of milk, as to render adventitious aid necessary for the support of the child. *Anxiety of mind* diminishes the quantity, and alters the quality of the milk. The reception of a letter, which leaves the mind in anxious suspense, lessens the draught, and the breast becomes empty. If the child be ill, and the mother is anxious respecting it, she complains to her medical attendant that she has little milk, and that her infant is griped, and has frequent green and frothy motions. Fear has a powerful influence on the secretion of milk. I am informed by a medical man who practices much among the poor, that the apprehension of the brutal conduct of a drunken husband will put a stop for a time to the secretion of milk. When this happens, the breast feels knotted and hard, flaccid from the absence of milk, and that which is secreted is highly irritating ; and some time elapses before a healthy secretion

returns. *Terror*, which is sudden and great fear, instantly stops this secretion.' Of this, two striking instances, in which the secretion, although previously abundant, was completely arrested by this emotion, are detailed by Sir A. Cooper. 'Those passions which are generally sources of pleasure, and which, when moderately indulged, are conducive to health, will, when carried to excess, alter, and even entirely check the secretion of milk.'

"There is every evidence that the mammary secretion may acquire an actually *poisonous* character, under the influence of violent mental excitement; for certain phenomena which might otherwise be regarded in no other light than as simple coincidences, appear to justify this inference, when interpreted by the less striking but equally decisive facts already mentioned. 'A carpenter fell into a quarrel with a soldier billeted in his house, and was set upon by the latter with his drawn sword. The wife of the carpenter at first trembled from fear and terror, and then suddenly threw herself furiously between the combatants, wrested the sword from the soldier's hand, broke it in pieces and threw it away. During the tumult, some neighbors came in and separated the men. While in this state of strong excitement, the mother took up her child from the cradle, where it lay playing, and in the most perfect health, never having had a moment's illness, she gave it the breast, and in so doing sealed its fate. In a few minutes the infant left off sucking, became restless, panted, and sank dead upon its mother's bosom. The physician who was instantly called in found the child lying in the cradle, as if asleep, and with its features undisturbed; but all his resources were fruitless. It was irrecoverably gone.' (Dr. Van Ammon, in his treatise, *Die ersten Mutterpflichten und die erste Kindespflege*, quoted in Dr. A Combe's excellent little work on *The Management of Infancy*.) Similar facts are recorded by other writers. Mr. Wardrop mentions (*Lancet*, No. 516). that having removed a small tumor from behind the ear of a mother, all went well until she fell into a violent passion; and the child being suckled soon afterwards, died in convulsions. He was sent for hastily to see another child in convulsions, after taking the breast of a nurse who had just been severely reprimanded; and he was informed by Sir Richard Croft, that he had seen many similar instances. Three others are recorded by Burdach (*Physiologie*, § 522). In one of them the infant was seized with convulsions on the right side and hemiplegia on the left, on sucking immediately after its mother had met with some distressing occurrence. Another case was

that of a puppy, which was seized with epileptic convulsions, on sucking its mother after a fit of rage.

In the case of Dr. Von Ammon the milk must have undergone a change which gave it a powerful sedative action upon the susceptible nervous system of the infant. The following, which occurred within the author's own knowledge, is perhaps equally valuable to the physiologist, as an example of the similarly fatal influence of undue emotion of a different character; and both should serve as a salutary warning to mothers, not to indulge either in the exciting or in the depressing passions. A lady having several children, of which none had manifested any particular tendency to cerebral disease, and of which the youngest was a healthy infant a few months old, heard of the death (from acute hydrocephalus) of the infant child of a friend residing at a distance, with whom she had been on terms of close intimacy, and whose family had increased almost contemporaneously with her own. The circumstance naturally made a strong impression on her mind; and she dwelt upon it the more, perhaps, as she happened at that period to be separated from the rest of the family, and to be much alone with her babe. One morning, shortly after having nursed it, she laid down the infant in its cradle, asleep and apparently in perfect health. Her attention was shortly attracted to it by a noise; and on going to the cradle, she found the infant in a convulsion, which lasted a few moments and then left it dead. Now although the influence of the mental emotion is less unequivocally displayed in this case than in Dr. Von Ammon's, it can scarcely be a matter of doubt; since it is natural that no feeling should be stronger in the mother's mind, under such circumstances, than the fear that her own beloved child should be taken from her, as that of her friend had been; and it is probable that she had been particularly dwelling on it, at the time of nursing the infant on that morning. Another instance, in which the maternal influence was less certain, but in which it was not improbably the immediate cause of the fatal termination, occurred in a family nearly related to the author's. The mother had lost several children in early infancy from a convulsive disorder. One infant, however, survived the usually fatal period; but whilst nursing him one morning, she had been strongly dwelling on the fear of losing him also, although he appeared a very healthy child. In a few minutes after the infant had been transferred into the arms of the nurse, and whilst she was urging her mistress to take a more cheerful view, directing her attention to his thriving appear-

ance, he was seized with a convulsion fit, and died almost instantly. Now although there was here unquestionably a predisposing cause, of which there is no evidence in the other cases, it can scarcely be doubted that the *exciting cause* of the fatal disorder is to be referred to the mother's anxiety. This case offers a valuable suggestion,—which, indeed, would be afforded by other considerations, that an infant under such circumstances should not be nursed by its mother, but by another woman of placid temperament, who has reared healthy children of her own." The mother or nurse should maintain great mental composure.

Of the quantity of milk ordinarily secreted by a good nurse, it is difficult to form a correct estimate; since the amount which can be artificially drawn, affords no criterion of that which is secreted at the time of the "draught." The quantity which can be squeezed from either breast at any one time, and which, therefore, must have been contained in its tubes and reservoirs, is about two ounces. The amount secreted is greatly influenced by the mental and physical condition of the female, and also by the character and quantity of the ingesta. In regard to the influence of the mental state upon this secretion, ample details have already been given. With respect to the physical state most favorable to the production of an abundant supply of this important fluid, it may be stated generally, that sound health, a vigorous but not plethoric constitution, regular habits, moderate but not fatiguing exercise, and an adequate but not an excessive amount of nutritious food, furnish the conditions most required. It is seldom that stimulating liquors, which are so commonly indulged in, are anything but prejudicial; and even where, as sometimes unquestionably happens, an improvement in the condition both of mother and infant is the immediate result of the moderate employment of them, it is questionable whether the remote effect is not of a reverse nature. Their *modus operandi*, when they are really beneficial, seems to lie in promoting the digestive process, and in thus aiding in the appropriation of those nutritive materials which constitute the real source of the solid constituents of the milk. (Carpenter.)

Changing Human Milk by Food.—Although all physiologists and paedologists admit that the milk is changed by the character of food; still, as far as the author can learn, no attempt has been made to take advantage of that fact. No rules for nurse feeding are given. It has been a great study to elaborate something practical on this head, and whether the author has succeeded, the proper tests must decide.

Nursing women may be divided into two classes: first, the lean, and second, the fleshy. These again may be divided into the dark-lean and fleshy, and the light-lean and fleshy. The darker the person the richer the milk, as a rule, while the lighter the more watery it will be. The leaner the person the more watery the milk, and the fleshier the person the more concentrated will be the milk. The softer the skin the richer and sweeter will be the milk, while the more gross person will give milk containing more casein. We found in the Foundlings Home that the gross, fleshy, bland Swedes were the poorest nurses. Their milk closely resembled cows' milk, i. e., small globules, with thick caseous fibrinous walls poor in sweets and scanty. The best nurses were the plump brunettes of medium stature with soft skin. The quantity of water may be easily increased by drinking fluids, especially warm water drinks containing milk or starchy food.

Now if the woman is spare, giving watery milk scarcely alkaline she will need richer food, like oat-meal gruel with milk, cocoa-shell-tea, chocolate and vegetable food with little meat except perhaps beef, mutton, fish, etc. If she is light the food will need to be richer. The blonde Swede craves sweets in great quantities. If the demands of the child is for richer food, at once, this may be secured by bathing the breasts with oil, lard, butter, etc. Good sweet oil is perhaps the most convenient. Palm oil, or cocoa butter may be used. This inundation must be practiced very gently and just before nursing otherwise the blood will absorb and carry off the oil, and the milk will be the worse for the interference. Lean nurses complain that the child "tugs at the breast" all the time. The oftener the milk is extracted the richer it is, so the child takes it often.

The fleshy nurse with milk rich in casein, needs almost the reverse of the above course of feeding. The globules must be swollen by fat, sweet, and water, consequently the best food is starchy food like bread and butter, mush, eggs, potatoes, etc., with warm drinks of milk and water or mild tea and coffee with plenty of milk and sugar. Such persons should avoid fibrinous food, as beef, oat meal, etc. The child may be given sweetened water just before nursing in these cases of fleshy nurses. A child under these circumstances may be early fed, partially at least with dextrine food.

For practical purposes we may make a guess at the quantity and quality of the milk by inspection of the breasts of the mother or nurse. Normally, they should be pear-shaped, hardish, and mottled with blue veins. On pressure of the gland the milk should squirt out. The

milk itself should be opaque and of a dull white color; under the microscope it should present fat globules of medium size, not too small. As a rule, the number of globules is a rough indication of the quantity of casein and sugar; although this, as has been said, is not always a trustworthy guide. The best test, however, of the goodness of the milk, is derived from observation of the child. It should be watched while at the breast, and if it sucks vigorously, finishes the meal with the milk running over its lips, and requires suck but a few times in the day, we may infer that the milk is sufficiently abundant. If, on the other hand, it constantly requires the breast, sucks laboriously, and with effort, occasionally desisting and crying peevishly, the milk is probably scanty. As an additional test, the infant may be weighed immediately before and after taking the breast; the increase in weight should be from four to six ounces, according to its age.

Many a good nurse is spoiled by rich, hearty food, in her desire to increase the milk in quantity and quality. The rich food produces indigestion with slight feverishness, which dries up the milk. The nurse should eat moderately, but may drink, especially between meals, freely. A bowl of thin oat meal or flour gruel should be taken in the night, and also between meals. Milk should be drank freely, but during the meals. If the nurse is spare or fleshy she should be treated as already indicated for these individuals. Anxiety about the child and to please may so change the character of the milk as to render it innutritious. The more intelligent the nurse, the more the nervous manifestation will be apparent. Nervous, suspicious individuals should not be employed for nurses. Fear is the chief form of the nervous expression that will be met in the ignorant nurse. If there is any uterine disease these nervous symptoms will be more dreaded and harmful. Judicious treatment, dietetic and remedial, will do much to correct the milk of those cases.

The influence of various medicines upon the milk is another important question, which has not yet been sufficiently investigated. As a general rule, it appears that most soluble saline compounds pass into the milk as into other secretions; but there are many exceptions. Common salt, the sesquicarbonate of soda, sulphate of soda, iodide of potassium, oxide of zinc, trisnitrate of bismuth, and sesquioxide of iron, have been readily detected in the milk, when these substances were experimentally administered to an ass; and ordinary experience shows that the human infant is affected by many of these when they are administered to the mother. The influence of mercurial medicines taken by the mother, in removing from the infant a syphilitic

taint possessed by both, is also well known. The vegetable purgatives, especially castor oil, senna, and colocynth, have little effect upon the milk; hence, they are to be preferred to the saline aperients, when it is not desired to act upon the bowels of the child. (Carpenter.)

Blue Milk.—Professor Mosler (Parkes' Practical Hygiene 3d, p. 239), has directed attention to the poisonous effects of blue milk, *i. e.* milk covered with a layer of blue substance which is, in fact, a fungus either the *didium lactis*, or *venicillium* (mould) which seems to have the power under certain conditions, of causing the appearance in the milk of an anilin-like substance. Milk of this kind gives rise to gastric irritation. (Steinhof). In four cases (Mosler) it produced severe febrile gastritis. Milk, although not blue, which contains large quantities of *didium*, (Hessling) produce many dyspeptic symptoms and even cholera-like attacks as well as possibly to give rise to some aphthous affections of the mouth in children. (Pavy.) Blue milk is produced by feeding cows with some vegetable substances, as *Myosotis palustris*, *Polygonum aviculare* (knotweed, downweed), *P. fagopyrum* (buckwheat), *Mercurialis perennis*, and other plants (Mosler) but this is different from the blue color referred to above.

Out of eighty-nine infants suckled by women in apparently good condition, fifteen were found by MM. Vernois and Beequerel to be inefficiently nourished. On careful analysis of the milk it was found that in all these cases the relative proportion of the butter was raised to 33.22, considerably above the normal standard (26.66) while the proportions of the casein and the sugar remained unaltered. What were the special evidences of this form of indigestion we do not know, but presume they were due to the butyric fermentation and the liberation of the fatty acids. The tongue presented doubtless a pale, flabby appearance and that there was an odor of spoiled butter and a persistent lienteria. There was doubtless also a profuse thick flow of saliva. Abstaining from fat food and living on lean meats and starchy food would soon correct this form of innutritious milk. Lengthening the hours of lactation to three will tend to decrease the quantity of fat in the milk.

Climate has a marked effect upon the secretion of milk and the relative proportion of its ingredients. Schukowsky gives thirty per 100 as the average proportion of oleaginous matters in the milk of Russian women. (Carpenter).

"Dr. Condereau, of Paris, has analyzed the milk of a young Esquimaux mother, now suckling two infants at the Zoological Gar-

dens, Brussels, and finds that it has a less proportion of salts, but is richer in sugar and especially fat, than the milk of European women. The consumption of a large quantity of fatty food to resist the extreme cold to which the Esquimaux are exposed, accounts for the presence of the abundance of hydro-carbons."—*La Presse Medicale*.

The fact that this woman is suckling two children and that milk is richer when drawn often, may partially explain the above.

Nervous Women.—The milk of a woman subject to nervous attacks became in less than two hours after each paroxysm, mucilaginous like the white of egg. (Payer.)

It sometimes happens that milk is secreted more or less abundantly, but, owing to some derangement of the maternal system, it is of a quality not calculated to afford sufficient nourishment for the child, and even causes decided sickness. In such cases the mother should be carefully treated in accordance with Homœopathic principles, when it will be found that as health is restored, the lacteal fluid improves, no longer disagrees with the child, and nourishes it as it should do.

The child should not be deprived of its natural sustenance for any light reason, nor until Homœopathic medication acting on both mother and offspring, has utterly failed to bring about the secretion of a natural and healthful milk on the one hand, and a normal receptivity on the other. In all cases where it is suspected that the quality of the milk is not good, it should be carefully examined, and tested, and in conducting this examination, the microscope will be found a very efficient aid.

Again the secretion may be all right in quality but deficient in quantity. The deficit is often owing to some unnatural state of the system, and the proper remedy should be sought to change that condition, so that the natural supply may be afforded. The habit of forcing a supply by means of porter or other similar stimulant, is alike injurious to the mother and to the child. (Guernsey.)

Homœopathy has taken advantage of the physiological fact recorded by Carpenter, and the following remedies that have been used for the last fifty years with valuable results. They should be carefully studied and one selected and confidently administered. In deficiency of milk, *Agnus castus* is the best remedy. Leadam reports some brilliant results from the use of *Asafætida* 3, even when the milk had entirely disappeared. *Castor oil* half a teaspoonful taken night and morning, or the leaves of the castor bean applied to the breast is highly recommended. Jahr gives his experience (Forty Years) as follows: "A deficient secretion or the voluntary vanishing of the milk is

sometimes remedied by *Puls.* or *Calc.* If the secretion is suddenly suppressed by fright, *Aconite* or *Ignatia* restores it. If by a fit of anger or vexation, by *Bry.* or *Cham.* After a *cold*, by *Puls.*, *Aconite* or *Dulc.* If the milk is *bad* so that the infant refuses to take it, *Merc.*, *Cina* or *Silicea* often correct this defect; and if too *thin*, so that the child does not gain by it, *China*, *Merc.*, or *Sulph.* If the milk *coagulates* too readily, *Borax*, *Lachesis*, and if it *sours* to easily, *Rheum* or *Puls.* If the breasts are turgid with milk and the milk does not run out, *Bry.* or *Bell.* and sometimes *Aconite* or *Cham.* will help; for a constant *involuntary* flow of milk, *Bell.*, *Calc.* or *Bry.* and very often *China* or *Puls.* are the best remedies."

Aconite should be administered when there is hot dry skin, much thirst, restlessness, discouragement, anxiety; breasts hard, burning hot, distended and knotted, with little or no milk.

Aethusa.—The child takes the breast with avidity; nurses plentifully, then vomits copiously and is exhausted, but soon rallies and cries for a fresh supply. The child's bowels are either costive or loose; it cries much and does not thrive. The mother is not well. The lochia is too thin and watery; she is very nervous; has a bitter taste in her mouth; milk disagrees with her; the abdomen is swollen and hard. In such cases *Aethusa* should be administered to both mother and child.

Agnus castus.—The mother is very sad and depressed; frequently says she will die; the milk is very scanty.

Asafoetida.—When there is an excessive sensibility of the vital organism, and the veins are unnaturally distended. More or less frequently indicated.

Belladonna.—The breasts feel heavy and appear hard and red, the redness often running in radii; flushed face and injected eyeballs; full, bounding pulse; drowsy, throbbing headache; sensitive to noise and light. From taking cold. After or with, *Bryonia*.

Borax.—The milk is too thick and tastes badly; often curdles soon after it has been drawn. Child screams while nursing.

Bryonia.—The breasts feel heavy, a sort of stony heaviness—rather pale, but hard; dry lips and mouth; constipation of burnt, dry faeces; splitting headache; nausea and faintness on sitting up. Follows well after *Aconite*.

Calc. carb..—The breasts are distended, the milk scanty, or when the milk runs out too easy; she is cold; feels the cold air very readily, chilly nature; there seems to be a want of vital activity to

bring the milk forward; when leucophlegmatic constitution; subject to leucorrhœa. Menses had been often and too profuse.

Carbo an.— Painful nodosities of the mammae. Nursing causes stitching pains in the mammae which arrest the breathing. She cannot bear to have the breasts touched or handled. The milk is thin and has a saltish taste.

Causticum.— The milk has almost disappeared in consequence of over-fatigue, night watching, care, anxiety, etc. It is especially suitable for delicate light-complexioned women. Generally constipation. Sensation in the stomach as though lime were slackening. Pulsations and noises in the ears. Threatened amaurosis.

Chamomilla.— The breasts are hard and very tender, with drawing pains, the nipples inflamed and swollen, preventing the flow of milk; she is restless, thinks she can hardly endure her sufferings; is fretful, sleepless and cross; when caused by a fit of passion. Child cries much with colic; stools green.

China.— The woman is very weak in consequence of loss of blood during labor, or too profuse lochial discharge, or from leucorrhœa. She feels worse every other day. Much pain between the shoulders. Feeling of fulness in the abdomen. The milk is scanty, thin and watery.

Cina.— Gnawing sensation in the stomach as from hunger, which is constant. Itching of the nose; does not sleep well, feels cross and irritable, and is not easily satisfied.

Coffea.— Much excitability and sleeplessness.

Croton tig.— The breasts may or may not be swollen, but the pain extends from the nipple to the shoulder-blade every time the child draws at the breast; the suffering is excruciating. An excellent remedy even if the breasts are hard and swollen.

Dulcamara.— The milk fails of being secreted, apparently in consequence of the patient having taken cold which has affected the breasts. The mammae are swollen, inactive, painless and itch. The skin is delicate, sensitive to cold and thereby liable to eruption.

Hyoscyamus if the flow is diminished by jealousy. (See *Phos. ac.*)

Ignatia.— When grief is the cause of the abnormal secretion.

Kali bich.— The milk as it flows from the breast has the appearance of being composed of stringy masses and water.

Lachesis.— The milk is thin and blue, and is rejected by the infant. She feels disconsolate and sad on awaking in the morning, and throughout the day has a dissatisfied and unhappy feeling. The

whole disorder may be the result of some long standing mental trouble.

Mercurius sol.—This remedy is especially suitable if there is a syphilitic taint of system. The breasts are swollen and hard, with a feeling as if they were raw and sore ; milk scanty ; ptyalism ; scorbutic appearance of the gums ; swollen glands and other symptoms indicative of *Mercury*.

Nux v.—Especially suited to women who use habitually, highly seasoned and rich food, wines, etc., or if the disorder arises in consequence of an error of diet. Constipation and disordered condition of the lochia.

Pulsatilla.—The breasts are much swollen, and rheumatic pains extend to the muscles of the chest, shoulders, neck, axillæ, and down the arms, etc. She is feverish and tearful but not thirsty. Feels better in a cool room, the milk is thin and watery, and the true milk globule is almost entirely absent. Bad taste in the mouth in the morning. Fatty rich food disagrees. Craves cool, fresh air ; the warm, close room causes her to feel very badly. In mild and tearful women in apparent good health who have but little milk. This remedy is often called for.

Phos. ac.—Scanty milk, debility and *great apathy*. Also in cases of jealousy. (Compare *Hyoscyamus*.)

Rheum.—Sour smelling diarrhoeic stools, with colic and shuddering during stool. The milk becomes thick and yellow, causes a similar diarrhoea in the child ; almost immediately after nursing the babe has a loose evacuation, which is sour-smelling, and is accompanied with colic. The milk contains colostrum or numerous oil globules.

Rhus tox.—The breasts are painfully distended and red in streaks, and there is a rheumatic condition of the whole body. Stiffness of the joints. The first movement is painful and stiff, but she can move easily afterward. She cannot lie long in one position ; she must change in order to find an easier place. Entire want of appetite. Mental derangement and thoughts of suicide. Vitiated locia lasting too long, and powerlessness of the legs. *Rhus* is valuable in warding off the ill-consequences of a suppression of the milk.

Sepia.—In women of very delicate and sensitive skin. Flushes of heat ; painful sensation of weakness in the epigastric region ; cold hands and feet ; she is disgusted at the smell of food.

Sulphur.—Flushes of heat, weak and faint and hungry about noon she cannot wait for her dinner, etc.

Silicea.—The infant refuses the breast or vomits immediately after nursing. (Compare *Aethusa*.) It often refuses to nurse at first, but afterward takes the breast with hesitancy and then vomits; it does not grow as it should. The mother is not well; she has the *Silicea* constipation, or other symptoms indicative of that remedy, e. g., great activity.

Zinc.—She is fidgety, especially in the feet which she cannot keep still.

Secale.—In women who are much exhausted from venous haemorrhage. In thin, scrawny women. The breasts do not fill properly with milk; there is much stinging in them.

If the milk seems abundant, and yet the child does not thrive, the fault may be in the mother, or child.

The following remedies may be indicated: *Calcarea carb.*, *China*, *Cina*, *Mercurius*, or *Sulphur* for the mother. To the child may be given to aid assimilation, *Calcarea*, *Silicea*, *Baryta c.*, *Borax*, etc. Or both may be given the same remedy that seems indicated by the combined symptoms of both.

Excessive secretion of milk will indicate either *Belladonna*, *Bryonia*, *Borax*, *Calcarea carb.*, *China*, *Conium*, *Phosphorus*, *Pulsatilla*, *Rhus* or *Stramonium*.

ANIMAL AND HUMAN MILK COMPARED.

In the analyses given the comparison is striking, and it is well to give this part of the subject careful attention, as the physician is frequently compelled to select an animal milk.

Vernois and Becquerel found that Tyrolese, Dutch and Swiss cows give milk containing nearly 7 to 10 per cent of butter, with much casein and albumen, whilst the cows in the immediate neighborhood of Paris furnished a poor milk containing only 3.6 or 3.7 per cent. of butter and little casein. Afternoon milk is always richer than morning, and the last drawn is richer than the first.

Cow's colostrum is described by Dr. Davy as being of a rich yellow color, less fluid than the milk of a later period, of a higher specific gravity (1075) slightly acid, and containing large oil-globules, a few irregular flakes, probably epithelium scales, a little granular matter like curd, and a small number of granular corpuscles, the largest of which are about the 1-500 of an inch in diameter. It coagulates on being heated to about 163°. The granular corpuscles when maintained at a temperature of 100°. exhibit feeble amoeboid movements (Stricker and Schwarz). They are probably epithelial cells of the mammary ducts which have undergone fatty degeneration.

The chemical composition of the solids of the colostrum as compared with (human) of a subsequent period, is well given in the following per centage table by Dr. Tolsmatscheff.

	<i>Age.</i>	<i>Temperament.</i>	<i>Casein and Albumen.</i>	<i>Fat.</i>	<i>Sugar.</i>
On 4th day after delivery...	23	Fair medium stature	4.188	2.471	4.33
On 6th " "	22	Large, fair, strong...	2.050	3.177	5.76
On 15th " "	22	Large, dark, strong.	2.077	2.939	5.90
On 36th " "	34	Large, fair, strong...	1.104	1.713	6.26

Physically considered the most marked peculiarities of the colostrum in the cow are the concentration of nutritive matter in it. The greater facility with which it coagulates by rennet, as compared with older milk; and its greater power of resisting change when exposed to the action of air. All of these are qualities which may be eminently serviceable viewing it as the first food of the young animal. Thus its easy coagulability may be adapted to the comparatively weak gastric juice of the young animal. Its power of remaining semi-fluid and of resisting change may adapt a part of it to the intestines to promote the removal of the meconium, whilst its concentration as nutritive matter may permit it to fulfil the same office for the young mammal as the food. Yolk for the oviporous vertebrate. The proportion of the different ingredients in the milk of different animals is subject to considerable variation, and this fact is of much practical importance in guiding our selection, when good human milk cannot be conveniently obtained for the nourishment of an infant. The first point to be inquired into is the quantity of solid matter contained in each kind; this may be determined either by evaporation or by the specific gravity of the fluid.

The specific gravity of human milk is stated by Dr. Rees (*loc. cit.*) to vary between 1030 and 1035; either, however, have estimated it much lower. That of the cow appears to be usually about the same. That of the cream, however, being 1024 and that of the skimmed milk about 1035. The variation will in part depend (as in the case of the urine) upon the quantity of fluid ingested, and in part it is probable upon the manner in which the milk is drawn. For it is well known to milkers that the last milk they obtain is much richer than that with which the udder is distended at the commencement. The quantity of solid matter obtainable from cow's milk by evaporation, seems to be usually considerably greater than that yielded by human milk, and there is also a considerable difference in the relative proportions of their ingredients, there being far more casein and less sugar in the milk of the cow than in that of the human female.

The following table exhibits the average proportions of the different ingredients, in the milk of various animals. These proportions, however, are liable to wide variations.

	WOMAN. (Simon.)	COW. (Simon.)	GOAT. (Chev- alier.)	SHEEP. (Chev- allier.)	ASS. (Simon.)	MARE. (<i>Luiscuius</i>)
Water	890	860	868	865	907	888
Solids.....	110	140	132	144	95	112
Butter.....	25	38	33	42	12	12
Casein	35	68	40	45	16	16
Sugar and extractive	48	30	53	50	65	88
Fixed Salts.....	2	6	6	7	—	—

It appears from this, that whilst the milk of the cow, goat and sheep have a general correspondence with each other, those of the ass and mare are fluids of very dissimilar character, containing a comparatively small proportion of casein and still less butter, but abounding in sugar, hence it is that they are much more disposed to ferment than other milk ; indeed the sugar of mare's milk is so abundant that the Tartars prepare from it a spirituous liquor called " Koumiss."

Although no milk more nearly approaches that of the human female in the proportion of its ingredients, than that of the goat, its casein forms a peculiarly dense curd, which does not suit the stomach of the infant ; besides which the milk is tainted with the peculiar odor of the animal, which is more intense if the individual be dark colored. Experiments with goats milk at the Chicago Foundling's Home was unsatisfactory. If the goat was fed on rich clover, oil cake, etc., the milk would be more digestible. The milk of the ass though differing in the proportion of its ingredients seems to bear a closer approximation in properties. Like the milk of the mare it is very sweet. The milk of the cow will usually answer very well for the food of the infant if care be taken to dilute it properly according to the age of the child and to add a little sugar. Where there is an apprehension of an early failure in the supply of milk, Carpenter has found it advantageous to commence feeding the infant once a day with this mixture soon after the first month. The number of its meals may be progressively increased until it becomes entirely independent of its parent without any abrupt transition ; and at the same time the proportion of water and of sugar may be diminished in accordance with the natural change which takes place in the milk of the mother during the progress of lactation.

Just how much water to add to the milk is the difficult problem, for the proportion of water in the milk varies in different countries. The milk sold in cities is usually very much diluted. Letheby says :

"The dilution of milk with water is easily detected by the specific gravity of the liquid, in the proportion of cream in the lactometer and by the poor appearance of the milk when seen in bulk, or under the microscope, or in a thin stratum."

There are other tests for diluted milk, as the specific gravity of the serum or whey after the milk has been curdled with a little rennet and filtered, and by the per centage weight of the dry curd. The results are approximately shown in the following table:

	Specific Gravity.	Percentage Volume of Cream.	Specific Gravity when Skim'd.	Specific Gravity of Serum.	Percentage weight of Dry Curd.
Genuine milk.....	1030	120	1032	1028	63
" " with 10 per cent. water..	1027	105	1028	1026	56
" " 20 "	1024	85	1026	1023	49
" " 30 "	1021	60	1023	1021	42
" " 40 "	1018	50	1019	1018	35
" " 50 "	1015	45	1016	1016	29

As already stated, the specific gravity of good milk ranges from 1028 to 1032; and any milk with a gravity below 1026 is either very poor in quality from natural causes, or it has been diluted with water.

Taking all the tests together, there will be no difficulty in discovering fraud, whether it has been effected by skimming the milk or by diluting it, and as salt is sometimes added to milk to increase its gravity and to improve its flavor, it is proper that the ash of the milk should be examined.

This ranges from six to ten parts in a thousand of milk, the average proportion being about eight parts. If, therefore, salt has been added, it will be discovered in the ash by the excess of weight, and by the salt taste of it. *Carbonate of Soda* is discovered in like manner.

To make cow's milk similar to human milk various directions are given beside the very indefinite one just noticed from Carpenter.

Ruddock says: "One ounce of sugar of milk dissolved in three-quarters of a pint of boiling water, and mixed, as wanted, with *an equal quantity* of good new cow's milk."

Dr. T. D. Williams Chicago, chemist, directs: "One teaspoonful of sugar of milk (German) dissolved in two or three tablespoonfuls of boiling water, to which add a half pint of milk" (city milk).

Pavy says: "A solution of sugar, or what is more in conformity with the natural state, sugar of milk, in the proportion of *an ounce to three-quarters of a pint*, of water, may be used, and at first mixed to

the extent of about *one-third* of this solution with *two-thirds* of milk. Later on, the quantity of the diluent may be somewhat diminished." p. 495.

Smith says: "For infants under the age of three months, cow's milk of ordinary richness should be diluted with an equal quantity of water or thin barley water."

Donne prefers the first milking when it can be obtained, as this contains a smaller proportion of the solid element than the average milk and requires but little dilution.

Many prefer the part of the milk containing more cream, *i. e.*, the last drawn. Others prefer "the top of the milk." Milk as fresh as possible, is allowed to stand two or three hours, and then the upper *third* of it removed for use. To one part of this, two, or even three parts of warm water or barley water, holding a little sugar of milk in solution, should be added.

Steiner says: "At first cow's milk should be diluted with *one-third* of water, in the second month only a *fourth* of water need be added, and after the fourth month pure milk may be given warm through a feeding bottle.

Sebert says: "I must declare as an abuse the dilution of milk for infants, usually with equal parts of water, or sugar and water. Cow's milk only contains 3 per cent more of solid constituents than woman's milk. A slight dilution with water would be advantageous, but the child easily digests cow's milk even when pure, provided it is of good quality, and comes from an animal equally well fed. In the beginning the child is sooner satisfied, and takes somewhat less; at a later period it is equal to relatively larger quantities.

Dr. Moore for twenty years has directed in case human milk cannot be obtained, proper for the child, to dissolve a heaping teaspoonful of sugar of milk, in half a teacup of *boiling* water and then add an *equal* quantity of fresh unskimmed cow's milk. If the casein is then not thoroughly digested, but is vomited or passed in hard white lumps, the addition of a little *pulverized Gum Arabic* to the mixture, will prevent the coagulation of the casein and ensure its more complete digestion. This he gives to the child before dentition, to supplement the mother's milk when scanty.

The amount of dilution will vary with different children. The child of a fleshy blonde will need less dilution than the child of a dark person. If the milk is very acid in reaction, a little *Carbonate*

of Soda may be added if the parties live inland, but if on the sea coast *Bichromate of Potash* will be better. Cows' milk is usually acid.

DILUTED CREAM.

For a very young child a teaspoonful of fresh cream, (cow's) diluted with eight teaspoonfuls of boiling water, into which has been dissolved a teaspoonful of loaf sugar has been found an excellent substitute for woman's milk. My friend, Mrs. Wilce, a very intelligent mother of large experience, uses this to supplement the breast milk, as well as a substitute. When fresh cream cannot be obtained, Dr. Baer recommends taking the top of new milk after it has stood two hours.

CONDENSED MILK.

In cities where pure fresh cow's milk cannot be obtained, condensed milk is used largely and especially during the hot months. Somewhat recently the milk from the rich pastures of Switzerland, Bavaria, Ireland, England and America, have been preserved by adding to it a third of its weight of sugar, and then concentrating it in vacuo until it acquires the consistency of thin honey. In this state it is run into tins, which are immediately soldered down and thus hermetically sealed.

At present there are many sources for the supply of such milk, the English market being chiefly supplied by the Anglo-Swiss Condensed Milk Company, whose works are at Cham, near Zug, in Switzerland; the English Condensed Milk Company at Aylesbury; and the factory of Mr. Newtham at Marlow, in Ireland. The American market is also well supplied by several companies. Of these we have no analyses.

The following is the average composition of such milk: (Letheby.)

COMPOSITION OF VARIOUS SAMPLES OF CONDENSED MILK.

	<i>Anglo Swiss.</i>	<i>Viris Swiss.</i>	<i>Sassin Swiss.</i>	<i>Kempton Bavaria.</i>	<i>Ordinary Milk.</i>
Casein.....	18.10	15.96	14.24	14.90	3.64
Butter.....	12.26	12.03	12.63	13.65	3.55
Sugar.....	44.25	46.92	51.83	50.21	4.70
Salts.....	2.41	2.67	2.48	2.43	0.81
TOTAL SOLIDS..	77.02	77.58	81.18	81.19	12.70
Water.....	22.98	22.42	18.82	18.81	87.30
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00

So that the concentration of the milk has been to about one-third of its original bulk, and therefore if it be diluted with twice its bulk of water, it will make a good milk of ordinary strength. Of the sugar in the milk from fourteen to eighteen parts consist of lactose or milk sugar, and the rest is cane sugar — hence the sweetness of the milk.

To render this milk similar to breast milk it is necessary to add

from eight to twenty parts of water according to the age and digestive energy of the child. The chief objection to this milk is its sweetness, and children who are made sick by sweet-food (and especially if the mother dislikes sweets) cannot tolerate it. (See *Argentum*.) When there is more sugar than is necessary to digest the casein, and the child has colic and eruptions, a little more casein may be added by gradually mixing small quantities of cow's milk with it. Oatmeal gruel may be added instead when the child is old enough to digest it. If the gruel is well cooked, and already well digested, and carefully strained it will be tolerated and readily assimilated. Cooked starchy food as rice, corn-starch gruel, should not be added, as they being changed into dextrin, then into sugar, simply increase the amount of lactic acid in the system, and consequently its tendency to disease.

Dr. Thos. Moore, Philadelphia, prepares condensed milk by adding one teaspoonful of condensed milk to twenty-six or twenty-eight parts of *boiling* water. It should be made stronger as the child advances in age.

ARTIFICIAL FOOD.

Artificial milk.—Attempts have been made to produce an artificial milk, but they are not very successful. Dr. C. A. Condereau for example, recommends a mixture of eight eggs with two ounces of sugar and enough water to make a pint and a half of liquid, to which he adds a little lime water and a small quantity of *Sulphate of Potash* and *Chloride of Sodium*. This may be tried.

Dubrunfaut states that a good substitute for milk may be made by emulsifying about 900 grains of *Olive oil* or other comestible fatty matter, with from 600 to 870 grains of sugar (milk sugar, sugar cane or glucose) from 300 to 460 grains of dried albumen (the dried white of egg, as met with in Paris) and from fifteen to thirty grains of crystals of *Carbonate of Soda*, dissolved in a pint of water. The liquid thus prepared has the appearance of cream, and requires to be mixed with twice its volume of water to produce a liquid like milk.

But experience has shown that although these substitutes may serve the purpose of milk under some circumstances, as when they are used by adults, yet they cannot be safely used in the nourishment of children, for, as Dumas suggests, it is very probable that there are minute quantities of other substances than albumen, fat, sugar, and salts in milk, which are necessary for the nutrition of infants. Even cow's milk does not always agree with them, the curd being very different from that of woman's milk, and it always requires to be

diluted with about one-third of its bulk of water, and to be sweetened with sugar before it is given to children.

DEXTRIN FOODS.

There are a class of foods that although styled farinaceous are not strictly so. They should be styled dextrin foods. In these foods the starch is half digested, being changed into a gum and the next change is into cane and then into milk sugar.

Foremost amongst these in reputation stands Liebig's, which in America is manufactured by Messrs. Horlick who puts it up in very convenient glass bottles, hermetically sealed

The food which Liebig recommends for infants is a mixture of malt with wheaten flour and milk, to which a little *Carbonate of Potash* has been added; and the reputation of it in Germany, as an article of diet for children is considerable. The preparation is made by mixing one ounce of wheaten flour with ten ounces of milk, and boiling for three or four minutes, then removing it from the fire, and allowing it to cool to about 90°. One ounce of malt powder, previously mixed with fifteen grains of *Carbonate of Potash*, and two ounces of water are then stirred into it, and the vessel being covered, is allowed to stand for an hour and a half, at a temperature of about 100° F. It is then put once more upon the fire and gently boiled for a few minutes. Lastly it is carefully strained, to remove any particles of husk, and then it is fit for the child's food. The composition of the food according to Dr. Liebig is as follows: (Letheby.)

	Plastic matter.		Carbonaceous matter.
Ten ounces of milk	.40 oz.	-	1.00 oz.
One ounce wheat flour	.14 "	-	0.74 "
One ounce malt flour	.07 "	-	0.58 "
	<hr/>		<hr/>
	0.61		2.32

The relation of the plastic to the carbonaceous being as one to thirty-eight, which is the right proportion for the food of children. The effect of the malt flour is to transform the starch into dextrin, and thus the mixture gets thinner and sweeter as it stands; and the *Carbonate of Potash* is added to facilitate the change, and to neutralize the acid constituents of the flour and malt.

This food does not agree well with thin muscular children and for very good reasons. When we consider the large amount of *Potash* in American wheat and barley, especially that grown upon new land, and the amount of *Potash* in cow's milk, and last of all, the amount of *Potash* in this class of children, we can easily understand why it causes

a serious diarrhoea in them. In Europe where there is more *Soda*, (*Chloride of Sodium*) in the air and grains, we can understand why Liebig recommended the addition of *Carbonate of Potash*. The author has advised that *Carbonate of Soda* be added to Horlick's Food, and with better results. The *Soda* is needed to unite with the bile acids and prevent their liberation. Much indigestion arises from their irritating presence in the intestines.

Boiled flour ball is an ancient form of half digested starch. It is made as follows :

Take one quart of good flour ; tie it up in a pudding-bag so tightly as to make a firm, solid mass ; put it into a pot of boiling water early in the morning, and let it boil until bedtime. Then take it out and let it dry. In the morning, peel off from the surface and throw away the thin rind of dough, and, with a nutmeg-grater, grate down the hard dry mass into a powder. Of this from one to three teaspoonfuls may be used, by first rubbing it into a paste with a little milk, then adding it to about a pint of milk, and, finally, by bringing the whole to just the boiling point. It must be given through a nursing-bottle.

Gerber's milk food is coming to be a popular food. It is made in Switzerland of condensed milk and cooked flour or bread. The dextrin taking the place of sugar, and when cooked in eight to twelve parts of water, according to the age of the child and its digestive capacities, it corresponds very closely to mother's milk. It has proved excellent in children where the butyric fermentation occurs so as to render a milk diet innutritious. It is well adapted to very young infants. As their powers of digestion increase they should have more casein than this food affords.

Nestle's milk food is similar. The coarsest of whole wheat-meal is mixed with milk condensed to a powder. The taste and action is similar to that of Gerber's food, with the exception that it seems to contain more casein and therefore is an older food, i. e., adapted to older children.

FARINACEOUS FOOD.

Food so called are, says Letheby, only baked flour, sometimes sweetened with sugar. The flour must be baked until it acquires a light-brown color, the temperature being about 400 or 450° F. The granules of starch are thus disintegrated and converted into a soluble substance, named *dextrine*, which by a further process of cooking or boiling, as in making pap, forms when properly sweetened, a very excellent food for children. Tops and bottoms so much used in Eng-

land, owe their value to the same circumstances, namely, that the farinaceous matter, which is so indigestible with infants, is broken up by baking into soluble dextrine. There are many varieties of this class of food in the market, and many domestic varieties.

Neaves' Farinaceous Food is one that Dr. Ruddock has given great prominence too. An analysis of it shows nitrogenous elements, 14.7; starch, gum, etc., 75.5; cellulose 3.5; mineral salts containing *Phosphorus* 1.2. Just how much of the starch is changed to gum or dextrine, we do not know. It should always be fed with milk, and is best adapted to children whose digestive powers are considerable.

Hidges' Food has a wide sale in America and corresponds closely to Neaves'. It is made as follows: Whole wheat is ground, after the siliceous coating is removed, then steam cooked in iron chambers, then it is ground again and sifted, sweetened and some *Carbonate of Soda* added to it. This food it will be seen retains the rich nitrogenous layer, next to the cuticle, which is called cerealine. This is very soluble, of the nature of diastase (a sort of artificial saliva) and has the property of dissolving starch.

Granum is another form of cooked flour which has been found an excellent combination with milk. Other *starches*, viz: arrow-root, tapioca, sago, *tous les mois*, salep, corn-starch are extensively used.

Dr. J. C. Morgan gives valuable hints on the diet of infants and

OLDER CHILDREN.

"These hydro carbons, alone, are calorifacient, and so far useful in that direction; but are utterly without value in nutrition of azotized tissues, except so far as to supercede the undue combustion and waste of these in the process of calorification. They also allay the sense of emptiness and hunger, when other foods cannot be taken. The same may be said of *sugar in every form*, including honey, molasses, rock candy, "gum-drops," etc. A dash of tea or coffee, in diluted and sweetened milk (commonly called "cambric tea,") may have a more positive influence against waste, or in some cases; supposing them medicinally unobjectionable.

"*Mucilages*," as of gum arabic, or Irish and Iceland mosses belong to the same category with starch and sugar; barring the iodine of the Irish, and the bitterish *cetrarin* of the Iceland moss. They are prepared by steeping either in cold, or better, in hot water; sugar or rock candy being added, if desired.

"*Gelatine*, as jelly, with or without wine, is comparable with the starches and mucilages. As a constituent of soup, prepared from a young shin-bone of beef (not wholly devoid of meat-fibre,) it may prove valuable. Pearl barley, or rice, may often be added with advan-

tage. So also, vegetables; which, for a young child should be strained out.

"The Germans prepare soups of many things not so used by Americans; and it may be well to learn from them. Milk-soup, bread-soup, etc., may be said to be soup or porridge-like preparations of those substances, rather thin, and often none the worse for that.

"*Vegetable soup* itself may be mentioned here. It is composed of all the ordinary market vegetables, in their season, so far as convenient; made into a decoction, and strained. Out of season, canned or desiccated vegetables may answer. In the preparation of these, and in all other sick-room cookery, so far as can be, non-metallic surfaces only should be allowed in contact with the materials used. A simple method is to put them into an ordinary bowl, setting this into a saucepan of water, and covering the bowl with a saucer; (the "water-bath.") The water in the saucepan is made to boil: and thereby, the food is duly cooked. If higher heat be required, a pan of sand (the "sand-bath,") may take the place of the saucepan of water. Miss Beecher favors the universal use of *salt* in cooking.

"*Strained vegetable soup* is prepared by boiling a teaspoonful of rice or barley in a quart of water, with a little salt, to which is added a large potatoe, a tomato, celery, if in season, a grated carrot, and a little parsley for flavor, if not objectionable on account of its medicinal properties. Other suitable vegetables may be used if desired. The vegetables should be finely chopped up before being introduced. After boiling slowly for several hours, the soup must be thoroughly strained through a fine sieve, and all the remaining undissolved matter, consisting chiefly of woody fibre, should be rejected as useless. This preparation should be given to children *only after* the eruption of the molar teeth." T. Moore.

Carrot food is made by grating an ounce of carrot into a half-pint of water, letting it stand twelve hours. Strain, then add bread, arrow-root, corn-starch, or cookie enough to thicken while it comes to a boil; salt and sweeten if necessary. Very valuable in low forms of disease.

"The inside of roasted potatoes, perfectly done and mealy, prepared to suit the taste, say with butter, milk or cream, and salt, will often prove good food if no contra-indication exist. As a general rule, all fruit and vegetables have a laxative tendency; but exceptions may occur; and a mealy roasted potatoe is as little objectionable as anything of the kind. Fricasseed, or steamed potatoes, prepared with "drawn butter" may sometimes do better, so far as delicacy of palate is concerned.

"*Various cereals* hold a high place as artificial diet. Maize, or *Indian corn-meal*, apparently the crudest of all, may at times prove palatable. The white meal, finely bolted, and extremely well cooked with water, salted to suit the taste, and dressed with cream and sugar, is usually wholesome as well as nutritious.

"Whole, cracked, or ground *wheat, barley, rye, oats, rice, beans, lentils,*

peas, in soup-like, gruel, or porridge form, strained, or made into bread; and as to rice, the well-boiled grain, all are available, prepared with cream, butter, sugar, etc., according to circumstances. Strained bean-soup has proved "just the thing" for a child convalescing from dysentery.

Luguminose is an infant food introduced from German, and is made from lentils (peas, etc.) With cream it has been found to agree with some young children.

"*Prepared wheat*, barley, etc., made with cream and water, not milk, are an extremely valuable class of dietetics. Hubbell, Moxey, Crew, of Philadelphia and other parties elsewhere, manufacture large quantities of the former. The latter answers a good purpose in rotation. Hubbell's process is essentially as follows: the grain, after threshing, being contaminated externally with a filmy silicious coating, is subjected to friction between two layers of wet canvass, to wash it off. It is then dried on webbing, with the aid of heat, afterward ground into flour in the ordinary manner, and finely bolted. The first one-sixth bolted is what is termed "pastry-flour," used rarely by any but pastry-cooks, and consisting principally of the redundant starch; this is rejected. The whole remaining portion is then floured and finely bolted, as often as necessary; and sifted in a shallow layer upon unglazed earthen plates, on which it is baked twelve hours at a temperature of about 212°, which bursts the starch granules, changes this to dextrin, and aggregates the layer into a firm mass. Finally, this is again floured and bolted. The product is a fine cream-colored flour, containing the normal quantity of albumen and gluten, a good proportion of the disintegrated, dextrinized, hence soluble starch, and all the earthy matters, as *Lime*, and *Magnesia*; along with the *Iron*, *Manganese*, *salivae*, *Sulphur* and *Phosphorus*; besides sugar and gum. In relation to the bowels it is anti-diarrhoeic; should it constipate, cream reverses this. Its preparation for use does not differ materially from that of other farinaceous diet. In this connection, a medical friend reminds me to urge, most strongly, two points: 1, boil these articles in water, two hours, (except those like Hubbell's, are already torrified,) in order that every particle of starch may be rendered soluble; 2, if milk be added, let it be only five minutes before taking off the fire, since it suffers by long cooking, in coagulation and loss of the albumen; and the necessary change of the starch in the meal is also counteracted by the same coagulum.

"Crew's Prepared Food" bears a general resemblance to Hubbell's.

"Moxey's Cerealina" is comparable with these, and derives its name from the nitrogenous, catalytic, digestive principle, named *cerealine*, contained in the grain next to the cuticle. All of these substances present the nutritive matter in a favorable state for solution in the stomach after but little boiling, and also deprived, to a varying extent, of the cruder portion of the bran. Similar remarks apply to prepared barley, etc.

The "Keystone Company's Flour with sugar of milk," is a compe-

titor with these, and may be preferred by some on account of the latter constituent.

Papoma, Nutrina, etc., are recent rivals.

"*Pearl Barley* is the crude article wholly deprived of bran, by mutual friction of the grains during continued agitation in a revolving mill; without other change.

"*Farina*, a well-known dietetic, is flour prepared from wheat which has been thus "pearled." Both of these consequently require long cooking in order to render their starchy constituents soluble. Moreover the pearlizing process is wasteful of the gluten and phosphates, so needful for the nutrition of muscle, bone, etc.; and which are largely removed, along with the bran.

"A better preparation, probably, may be improvised by an old-fashioned recipe known as "*Boiled Flour*" already mentioned. It has some repute as a remedy in diarrhoea, given in the form of "pap."

"Various agreeable dietetics, commonly used for dessert, may be made from farinaceous substances as food for the sick, and for young children. Plain puddings, and *blanc-mange*, are examples. The manufacturers as "*Cerealina*," etc., give more or less explicit directions on their packages as to these.

"*Racahout*, as prepared by Hubbell, is composed of arrow-root, salep, (another starchy principle,) farina, and sugar of milk, with cacao; flavored slightly with vanilla. It is used as a nutritious drink, resembling chocolate in some degree. It is suited to nursing mothers and convalescents, as well as to some children.

"*Hominy*. (Indian corn, deprived of its siliceous exterior by steeping in lye,) if soaked in cold water over night, and subjected to long boiling, lastly dressed with butter and salt, is a digestible as well as delicate dish. But for children, the smallest hominy, i. e., *Grits*, should be used; so, also, in the case of convalescents generally. The thorough cooking of these is the condition of their digestibility.

"*Mush*," renowned in verse as "hasty pudding," or fine white Indian meal prepared by very long cooking, salted, and dressed with milk, butter, molasses, or sugar, is a well-known and very important dietetic, often too much overlooked.

"The same sort of preparation of oat-meal, "oat-meal mush," is often preferred; and rye-flour is equally in favor with others. Oat-meal is, to some, when used at supper a positive laxative.

"*Gruels* of the same materials are familiar. Less known, are gruels made of *rice-flour* or *pulverized cracker*, or *soda-biscuit*. "*Cracker-dust*," ready-made for other purposes, may be employed conveniently for this, and produces a very good dietetic. Unbolted, or "*Graham flour*," may be used in like manner, thus securing a large amount of nutritious matter, in the way of gluten and phosphates, which are lost in preparing fine flour.

"*Bran-mush*, well cooked, is often acceptable dessert for the well, and may be dressed as suggested above; being, like other forms of bran-flour, laxative to the bowels. Thick, or thin like gruel, it may become a special diet for children.

"*Bran-bread*, or Graham bread, is valuable for similar reasons, and is, like the other forms, in favor with dyspeptics who are constipated, on account of the mechanically laxative effects it exerts. So, also, *bran-crackers*. The same may occasionally be used for children, prepared in any of the forms in which ordinary bread and crackers may be given — of which, we shall have something to say directly. *Bran-bread-pudding* consists of the crumbs of bran-bread, over which has been poured boiling cream, sweetened to suit.

"*Rye-bread* is suitable for rotation with other forms, or even as a main diet.

"*Plain panada* is a primitive but often (when rightly made) very palatable diet. It should be prepared thus: Remove the crust of a slice of baker's bread a day old, break it small into a hot bowl, sprinkle with sugar to suit the taste, pour over this a liberal portion of cream or rich milk, and finally, enough *scalding hot* water to cover the bread; *chop* it rapidly with a silver butter-knife until reduced to a fine, loose pulp (never mash it with the side of the knife or spoon,) and allow it to stand until cool enough to swallow, when it should be eaten.

"*Cracker*, sweet or plain, or other kinds of biscuit, dry or soaked in water, or "*cambric tea*," buttered or not, are often invaluable.

"*Ordinary bread and butter*, or *bread and gravy*, and the like, when moist, often affords a good nutriment for even very young children, as most mothers are aware.

"*Unfermented bread*" and biscuit — i. e., made of dough without yeast, but charged mechanically with pure atmospheric air — may be preferred when common bread sours on the stomach.

"*Bread toasted*, deprived of the crust, may be treated in a similar manner, and may prove serviceable if flatulence from decomposition of food, etc., be a symptom; and also for the mere purpose of rotation. But occasionally it causes such symptoms when not already present, probably in the character of *carbo vegetabilis*. The ordinary milk-toast, cream-toast, or water-toast, with butter, may often be utilized in the case of children.

"*Zweiback* — bread of the kind called "*rusk*," or "*tea-buns*." twice baked — that is, baked in slices, is susceptible of minute division with ease, and may be used somewhat like cracker-dust in a gruel form, or in panada or soups.

"*Sponge-cake*, plainly made, is something which most children relish, — similar cake is "*lady-fingers*." Both of these may be given dry, or moistened, to almost any child, sick or well.

"The youngest children, those who have no teeth, may be fed with comparatively strong food, if the mouth of a healthy person be employed to masticate it beforehand. The starchy part of bread, crackers, etc., is thus acted on by the saliva, and all substances perfectly comminuted before administration. Hence, a most important diet for a half-fed infant, sick or well, may often be found in *chewed cracker, chewed meat, etc.*

"A child may, if not voracious, be satisfied by *sucking a cracker*, or

a tough crust of bread, held to its mouth. The same may be said of meat cut into a strip, parallel with the grain, in order not to separate in chunks. But so brittle a substance as soda-biscuit should not be so used, lest, as I have witnessed, a small flake getting over the glottis fatal suffocation occur.

“Meats of various kinds are all-important in many cases of artificial feeding of infants, whether in fluid or more substantial form. They should be neither too young nor too old. Both are indigestible, and do mischief each in its own way. Mature but still young meat is valuable in various forms. Beef, mutton, and chicken may serve as types of all, and may be resorted to in rotation. Salt meats may vary the list.

“*Common soup* has already been alluded to. Decoctions of the above are familiar as *beef-tea*, *mutton-broth*, *chicken-tea*. Farinaceous or other addenda are sometimes employed.

“*Beef extract* (often misnamed *beef-tea*) may be prepared fresh, or its partial equivalent obtained from a roast joint when cut. It is best made in a good-sized clean bottle, putting finely divided beef within it, corking tightly, and boiling the bottle in water for some time. The liquid is then poured off; a trifle of salt should be added. Salt put in at the beginning of any such process may become so concentrated as to render the extract or the decoction unfit for use; and even without this, the natural salines may occasionally do the same.

“The *concentrated beef-extract* so commonly sold is, when not objectionable to the taste, of great value. In wafer-capsules it may be made applicable in still other cases, perhaps. This is sold as Liebig’s Extract of Beef, sometimes under other names.

“*Cold infusion of beef*, salted slightly, may prove agreeable as a diet drink when such temperature only is acceptable. The process of percolation *a la Cafe Francaise*, may be applied by non-metallic apparatus to finely divided meat, the product being kept surrounded by ice; or being finely divided and pounded in a crash cloth, it may afterwards be subjected to a strong press, a little water added to the residue and pressed again, just as in the preparation of the fruit syrup.

“*Cold beef-tea with Acid*.—Take lean beef, one-half pound and chop fine; add water twelve ounces, salt one teaspoonful, and *Muriatic acid* three drops. Let it stand two hours, strain, and it is ready for use.

“*Meat, raw or cooked*, may be *scraped*, so as to afford nourishment for an infant; or it may be finely *hashed*, as if for sausage. The latter may be reinforced by potatoes, etc., when not contra-indicated by diarrhoea. The great danger is that the comminution may be imperfect. This must be guarded against.

“*Damascene preserve* consists of raw beef chopped and pounded, along with white sugar, until finely comminuted. This has proved a life-saver in many instances. The one doubt of its value lies in the possible presence of parasitic germs (as of *tænia*) in any form of raw meat.

"Frying, as a method of cooking is generally objectionable; but meats *broiled* or *roasted*, are good; the latter, especially. A close utensil, such as a "Dutch oven," which retains every particle of vapor, is economical of the volatile principles, and hence secures the choicest product; which may then be employed in any of the ways herein alluded to. The same instrument bakes the best Indian corn bread. An excellent temptation to appetite is found, often, in a *wafer of beef*, the thickness of cardboard, cut across the grain, carefully broiled, buttered and slightly salted; and for a little child, *very finely divided*.

"*Stews* and *Fricassee*s are adapted to those who can chew, when convalescent, and to whom the peculiar flavor of a roast may be disagreeable; or in the way of rotation, very fine hashes may suit some who cannot masticate.

"*Dessicated meats*, i. e., with the moisture completely evaporated may be sometimes utilized; being easily grated, and containing in this state, a large proportion of absolutely nutritious matter. This may be given like the beef extract, in hot water, or dry, in a suitable vehicle, as the wafer, or jelly, or stewed fruit, which may be punctured to insert it; small masses at a time.

Fish have a certain value in the dietetics of childhood, as well as of older persons. Fish without scales are to be generally eschewed, but this leaves a long list of scale-fish, which admirably fulfil the requirements of organic and inorganic elements of nutrition, especially in nervous exhaustion; phosphorous being prominent among the principles thus afforded—and in a state prepared for assimilation. Being easily picked to pieces, a young child can take it. Rock-fish, boiled, and dressed with drawn butter, broiled or "planked" shad, perch, etc., etc., are prominent, and the cosmopolitan "Digby herring," (a very small, smoked fish,) eaten raw, proves a capital appetizer.

"*Shell-fish*, i. e., *oysters*, (rarely clams,) are often a boon. The juice, or the soup of a plain stew, with cracker or otherwise, may be the initial form; afterwards, the tender portion of the oyster itself. In stewing, the juice is to be first cooked with milk and salt, and the oysters added when it boils; letting them remain on the fire only until heated through. Thus, they remain tender.

"*Oyster-hash*, very fine, made only of the tender portions of such stewed oysters, may be given when that form is most manageable. Even a fried oyster may sometimes be chewed very fine by the mother of a sick or badly nourished child, and prove in this state a grateful and digestible diet.

"But one of the most precious hints I have ever received in the matter of diet, was derived from a half nourished babe, in the presence of a plate of raw oysters. It made such violent demonstrations of craving for them, that the mother, holding a fine one by the tough muscular portion, allowed the child to suck the remainder, which it thus demolishes in a short time; and by acting on this hint, the difficulty in its case was abridged at once. I have since repeatedly pres-

cribed the same, with excellent effect — even in adults, who, whilst unable to *eat*, could yet *suck* a raw oyster.

“ *Eggs* in various forms, are another staple. They contain (the yolk especially,) all the essentials of nutrition.

“ Allusion has already been made to raw yolk and cream. It may be given by the mouth, a teaspoonful, every half hour or hour, *as a dose*, when there is unwillingness to eat it. An enema of a wine-glassful or less may be given every two or three hours, when it is refused otherwise; and it will nourish almost as well in this way; being fully absorbed by the rectal mucous membrane.

“ Hard-boiled yolk of egg is fairly digestible; and may be mashed with a little butter or cream, and salt, and given in doses. This, or any other semisolid substance, may be given diluted with water, cream, etc. Continuous, compulsory nourishment is in many low states of the system, an essential condition of saving life. Small in quantity, wholly and comprehensively nutritious, such doses are often particularly useful; and, in rotation with other articles, as (in the absence of fever, or at least, when the urine is capable of forming sediment,) beef-tea, beside prepared wheat or barley, etc.; may enable us to carry the patient over some very dangerous places.

“ In cough-cases, intestinal disturbance, etc., *white of egg with water*, kept cold by setting in a bowl of ice, and given in sips, is often a palatable demulcent and nourishing drink. Or, if a high temperature be wished for, it may first be mixed with very warm (not boiling) water, and set, in a hot water bath, on the stove or nursery lamp.

“ *Egg-soup* is the same as the last, with the addition of the partially beaten yolk; and in this case a little salt will be desirable.

“ The ordinary *soft-boiled egg*, especially with bread-crumb and a little butter and salt, is a frequently available diet for young children.

“ *Plain custard*, i. e., egg, milk and sugar, without spices, may sometimes prove an agreeable form.

“ Fruits, recent and dried, are useful adjuncts to other food, affording a vehicle, or it may be a dressing for less palatable things. Perfectly ripe, sound, well-flavored fruit, deprived of skin and core, is much more rarely hurtful than is often supposed. If even it should prove indigestible, eaten with imperfect mastication, (as ought to be expected,) attention to this point may obviate the trouble, and secure positive benefit. A very simple and easy method of administration consists in scraping the pulp with the end of a silver knife, and placing upon the child’s tongue. There is a general laxative impression to be anticipated, however, from the use of fruit. Apples, bananas, or other succulent forms, eaten at bedtime, are a favorite resource with many constive persons. Dried figs or raisins roasted, or tewed in milk, have a value other than dietetic, in cases of immature gumboil, to which they may be usefully applied (within the mouth) as a poultice, after splitting. Again, ripe fruit may be mashed and strained through a coarse medium, as cotton lace, thoroughly cleansed from its stiffening material or sizing. Jellies may be prepared from

this by the addition of sugar and gelatine, and kept ready for use. No metallic substance should, if avoidable, be brought in contact with the fruit. *Stewed fruit* are often a convenient, agreeable and somewhat laxative diet — prunes especially ; although I prefer the dry, uncooked prune, freely eaten, for this purpose. *Canned fruit* is often good substitute for the fresh, but glass or stone jars are better than metal cans. The juices of new fruit, made into *syrup*, are of great value in the preparation of drinks for the sick. *New cider*, new wine, or other natural juices, set in ice, may prove grateful drinks. These may be varied occasionally with *toast-water*, preserved in like manner. This is good only when the untoasted portion does not come in contact with the water, and then the bread is really *toasted*, not *charred* in any degree. Slices as large as a man's thumb, of baker's bread a day old, toasted just brown on every side, are to be steeped in cold water until the latter is sufficiently colored ; then carefully lifted out without breaking. This is real toast water. "*Crust coffee*" resembles this, but is made with good crust of bread and hot water, and may be used as ordinary coffee.

"*Wheat coffee*, *rye coffee*, etc., made of the roasted grain, so familiar in war times, may be used by the sick as substitutes for genuine coffee, with or without the addition of a trivial flavoring of the latter. Like the real coffee, and tea as well, they may be used hot, with or without sugar and cream ; or, again, may be iced, as many epicures prefer in the use of these their favorite dietary stimuli.

"The goal we seek in the case of infants who are incapable, from retarded dentition, of masticating the solid food which their age and size seems to require is, the completion of this process at as early a moment as possible ; after which, we may rest easy, in most cases, on the score of their nutrition, unless suffering from some fit of sickness.

"Certain dietetic preparations, as Castillon's Powder, are composed of farinaceous substances with an appreciable quantity of calcareous matter. My preference is decidedly in favor of giving the food and medicine separately. Ordinarily I find satisfactory results, i. e., the speedy cropping out of a full set of teeth, from persistent attention to the foregoing considerations as to diet, with a weekly dose of *Calcarea phosphorica*, first decimal trituration, at bedtime. When the gums begin to swell like the buds of a tree in the spring, the medicine has done its work, and may properly be withdrawn. Should the irritation be excessive, *Gelsemium* may have to be given, or perhaps *Aconite*, *Chamomilla*, or *Belladonna* instead. But the withdrawal of the nutrient stimulus will commonly settle all trouble shortly."

THE BEST FEEDING APPARATUS

for the infant is a bottle holding about four ounces, with a black rubber nipple for a cap. This is the easiest kept clean. The chief objection to it, is that it is hard to draw. A long tube passing through the cork with a valvular opening, having a glass tube to pass into the

milk is the one that is usually chosen. This apparatus needs the most careful attention, or the milk becomes tainted—the sulphur in the rubber, like the sulphur in the casein, starting fermentation. If the milk stands in this bottle only fifteen minutes, it is unfit for use. On the whole, it is safest to always recommend the *black* rubber-cap nipple. The white contains more sulphur, and some say also zinc. The bottle and tube should be cleaned as soon as used, and kept in a basin or bowl of water. During hot weather it is well to add a pinch of soda to the water, as this will arrest the butyric acid fermentation, which is so deleterious to the child.

REGULAR FEEDING.

The child should be fed as regular as possible, about once in two hours. The young infant, after the milk is well established, may need the food oftener, while the older it grows it will eat less often, unless the milk is scanty and hard of digestion, when it will want to "nurse all the time." The old fear of milk fever and its evil consequences often induce the mother and nurse to put the child to the breast very often, especially during the third and fourth day. This habit has upset more children than a few. Drawing the milk frequently increases its flow and richness. This, with the nervous anxiety attendant upon the effort of making a repleted child nurse, often deranges both mother's milk and child. The breasts are best emptied with a pump. The mucous membrane of the alimentary tract is rarely in such a mature condition that it will stand this early and sudden gorging without some disorder arising. Over-eating makes the child more stupid than usual during the first days, then digestion is suspended and disease generally follows. Children that were loaned from the Chicago Foundling's Home to relieve gorged feverish breasts, were so stuffed, and this repletion gave rise to such severe indigestion, that few of them survived and the practice had to be abandoned. A child with colic and gastritis is disposed to feed frequently. A little sweetened warm water should be given it instead of food.

Infants should be fed occasionally as early as the fourth month, even when the mother's milk is sufficient. It then begins to "drool" a little. This accustoms the child to feeding and at the same time relieves the mother. It better be fed in the forenoon, or if the mother's milk is scanty in the early evening, then it will be apt to sleep till about midnight or later. If the child is colicky, the early part of the day will be the best time to feed it. The food should first

be one of the dextrin foods. If the tip of the tongue should present a red granular appearance, indigestion is present, and feeding should be omitted for a time. Then begin again.

WEANING CHILDREN.

There can be no rule established to which all must conform. The normal appearance of the teeth is an index that the child should eat instead of nurse. Some mothers, having a great dread of the second summer, insist on nursing the child, but the poverty of their milk and their anxiety, often combine to upset the child. Then it is often difficult to switch such a child off onto a food appropriate to its digestive capacity.

Children born in the spring may be nursed till the next fall, if the milk supply is abundant and the mother judicious. With a competent attendant, I prefer that the child be weaned when its incisors are cut, *i. e.*, about the twelfth month. The molars call for starchy, vegetable food, and the tardy transformation of this into lactic acid, prevents the dissolution of the phosphate of lime in the blood, which occurs when this acid is easily generated by milk and sweet food. The bony development, teething, etc., is thereby facilitated. When the milk is scanty and sour, it is the cause of many a so-called case of cholera infantum. The child should be nursed or fed, according to its digestive capacity, and not according to its age. If it does not thrive and grow strong and keep plump, the milk is at fault, and the child will be better, if fed either partially or entirely.

Teste's plan of weaning the child from milk is as follows: "Take of beef and veal, each three ounces, boil them six hours in a quart of water, add a little salt—skim when cold,—mix this broth with equal parts of cow's milk and water, and warm it a little for use. Suppose increase every day the quantity of meat in the broth, and of broth in the mixture, so that the milk shall finally disappear, and I venture to affirm, that we shall have solved one of the most important questions in the hygiene of children." This broth does not differ much from milk, and would be improved for infantile digestion by the addition of bread, or some well-cooked (dextrin) farinaceous food.

The physician well posted in infantile digestion, and the scope of the various foods, need never fear to wean a child from breast-milk, (even in summer) when that disagrees.

FOOD FOR WEANED CHILDREN.

Up to six or seven months, no other food but milk should as a rule be administered, for infants have not the power of digesting farina-

ceous or fibrinous substances, and a child may take from two to three pints thus diluted daily, and starve. After seven months, and to about twenty months, farinaceous matters may be mixed in gradually increasing quantities with the milk, but they should be well cooked by first baking them, and then thoroughly dissolving them by boiling. After this age, and up to the third year, the quantity of well cooked farinaceous articles may be still further increased and given as puddings with a little egg. Bread and butter may also be eaten, and towards the end of the time that child will digest well boiled potatoes with a little gravy of meats.

From the third to the fifth year a little meat may also be given, and at the end of the ninth year it may partake of the usual food of the family; but all along it should make use of a large proportion of milk, or milk puddings with eggs.

About the tenth year a child will require about half as much as a woman; and at the fourteenth year it will eat quite as much as a woman: in fact the proportion of food required by the child is much greater per pound weight of the body than by adults, because it has to form its tissues and build up its several structures.

Dr. Edwin Smith, calculates that the proportions of carbon and nitrogen in the daily food at different ages should be, per pound weight of the body, as follows:

	Carbon grs.	Nitrogen. grs.
In infancy	69	6.78
At ten years of age	48	2.81
At sixteen years of age	30	2.16
At adult life	23	1.04
In middle age	25	1.13

So that for its weight the infant requires three times as much carbonaceous food, and six times as much nitrogenous, as an adult.

DISEASE TENDENCY OF IMPROPER FOOD.

The diseases which are incidental to an abuse of the law of nutrition we may briefly glance at it. It may be said in general terms, that too much or too little of either of the main constituents of food will soon be followed by marked derangement of the animal body.

An excess of respiratory food (fats and sweets) not only promotes fat, but actually interferes with the nourishment of muscular tissue. Those who feed largely on rice, potatoes, or other farinaceous foods, or who indulge too freely in malt liquors, have commonly a bloated (excessively alkaline) appearance and have no faculty for sustained exertion.

On the other hand, *when the plastic elements of the food are in excess* the system becomes excited; too much blood is formed, and diseases of a plethoric character are induced. Medical travellers say that savages who feed almost entirely on animal food are subject to itch, scurvy, leprosy, malignant ulcers, and putrid fevers; but besides this according to Liebig and his followers, an excess of force is developed, which manifests itself in irritability of temper, and in a savage disposition. How far this may be concerned in the frequently ungovernable conduct of some children may be deserving of consideration. A nation of animal feeders, says Liebig, is always a nation of hunters, for the use of a rich nitrogenous diet demands an expenditure of power, and a large amount of physical exertion, as is seen in the restless disposition of all the carnivora of our menageries.

A deficiency of food, however, is quickly followed by a general breaking up of the animal frame. Plague, pestilence, and famine are always associated in the public mind; and the records of every country show how closely they are related. The medical history of Ireland is remarkable for illustrations of how much mischief may be occasioned by a general deficiency of food. Always the habitat of fever, it every now and then becomes the very hot-bed of its development. (Letheby.) In the growing child the effects of deficient food are manifest in all its future life.

DISEASES OF THE STOMACH.**DEVELOPMENT, ANOMALIES AND POSITION.**

Development.—The stomach originally consists of a long tube, somewhat larger than the rest of the digestive tube, situated vertically, or rather obliquely from left to right, until the great tuberosity, which, at first, is scarcely apparent, begins to acquire a greater volume, thus changing a little the primitive form and direction of the organ. The œsophageal opening is of considerable dimensions during the whole time of gestation; the pylorus begins to narrow about the fourth month; and from the sixth month until birth, the valves surrounding this orifice becomes more apparent; and at the time of birth it is generally perfect, although the contrary assertion has been made.

The stomach exhibits *anomalies*, particularly with reference to its situation. There exist several cases of a total inversion of the abdominal organs; and the stomach often partakes of this derangement. M. Baron has met with several instances at the Hospices des Enfans Trouves. The anomalies of form are also frequent; they are, however, but slightly developed: such as the strictures which appear in its length, and which divide it, as it were, into two or three parts; a disposition analogous to that which is observed in certain animals. It is rare to see no communication between the stomach and duodenum, or to see but a very narrow opening into this intestine; yet Fleischman, as quoted by Meckel, found a considerable stricture complicated with the absence of the pyloric valve. (*Anat. gener. descript. et patholog.* t. 3, p. 430.) The entire absence of this organ is only observed in those children deprived, at the same time, of many of their organs. Various malformations are referred to on page 64.

The *position* of the stomach is worthy of notice, it being in the left hypochondrium, and tilted up under the ribs. If we remember that the liver is large, occupying at birth more than one-third of the abdominal cavity, reaching beyond the median line, we can understand why the stomach is crowded far over to the left. The spleen is at this time very small. Luschka who has written a special work on the stomach, places the adult stomach in the same position as above

described. This knowledge of the position of the stomach is of great value, especially in cases of indigestion. The child should be placed on its right side when the stomach is distended.

VOMITING.

Vomiting has frequently a different signification in infants from that of adults. It is not strictly speaking a disease, but yet a disease expression of such importance and value as to deserve separate consideration. A great number of infants, as often as they have been nursed, throw up the milk without any retching, without any distortion of the features, and without any consequences ; this occurs all the more readily if they have been moved about or dandled up and down after nursing. It may also arise from an overloaded state of the child's stomach when the nurse has a free flow of milk. This vomiting is very much facilitated in children by the position of the stomach and the slight development of the blind sac, the fundus ventriculi, on account of which the contents of the stomach are not as in the adult, driven toward the fundus during its peristaltic action, but forced directly into the cardiac orifice, and when that inlet is incompletely closed, a regurgitation of the food will immediately take place (Vogel). Another form of vomiting, which though violent and frequently repeated, is attended by few or no indications of general intestinal disorder. The child in such cases seems well, but so great is the irritability of the stomach that the milk is either thrown up unchanged immediately after it has been swallowed, or it is retained for a very few minutes and then is rejected in a curdled state, while each application of the child to the breast is followed by the same result. It will generally be found, when this accident takes place in the previously healthy child of a healthy mother, that it has been occasioned by some act of indiscretion on the part of the mother or nurse. She has perhaps been absent longer from her nursing than usual, and returning tired from a long walk or some fatiguing occupation has at once offered it the breast and allowed it to suck abundantly, or the infant has been roused from sleep before its customary hour, or it has been over-excited or over-wearied at play, or in hot weather has been carried about in the sun without proper protection from its rays. The infant in whom from any of these causes, vomiting has come on must at once be taken from the breast, and for a couple of hours should remain unfed. One or two teaspoonfuls of water should be given it, and if the stomach retains it, the child may be cautiously fed (West). A common error committed by nurses, is

that of giving the breast to infants immediately after they have ejected the contents of the stomach, or allowing the stomach to become replete by allowing them to lie at the breast all night. Children brought up by hand vomit very often, but here nausea, sleeplessness, and hot state of the body precede the vomiting, the act itself is combined with retching and contractions of the abdominal muscles, and its effects are digestive disturbances of all kinds and emaciation. The matter vomited does not consist purely of the undigested nutrient, of the cow's milk, of the broth, or the soups, but a large quantity of mucus is already mixed with it, and it, and the cow's milk is curdled into hard lumps. The more or less coagulated state of the milk discharged from the stomach, most generally arises from its having remained in that organ a short time before its ejection ; the milk invariably undergoing coagulation in the infant's stomach previously to its digestion. In some cases, however, the coagulation of the milk as well as the vomiting appears to be due to the secretion in the stomach of an undue amount of acid. The breath of the infant, and the coagulated milk thrown up have a sour smell, and very often sour, curdy evacuations take place from the bowels, preceeded by more or less griping. It is not uncommon for dense coagula of milk to form in the stomach of an infant, in some cases causing severe colicky pains, and in others, violent convulsions which cease upon the rejection of the coagula. (Condie).

Symptoms.—A child affected with nausea has a deathly pale face, the forehead is covered with a cold perspiration, the eye is heavy, the respiration profound, labored and irregular, the pulse is so small that it is barely perceptible. It lays down and moans lowly ; occasionally it puts its hands in the mouth and bears an expression of the utmost anxiety upon its countenance. This condition may last several hours. Suddenly violent vomiting comes on, a large quantity of liquid food flows out of the mouth with a gush, a few retchings follow, accompanied by a loud outcry from the frightened child, and the whole morbid picture is instantly gone. Then, as a rule, a deep, long sleep succeeds, after which, if only an overloading of the stomach with coarse, undigested food was the cause, the child will wake up perfectly well, or at the most will suffer for a short time from a diminished appetite, and have a furred tongue. When children are attacked by an acute exanthema, typhus fever, or pneumonia, vomiting of the last enjoyed meal, as a rule, takes place in the first day of the disease. If a round worm has found its way into the stomach, then the

acid contents of that viscus seem to disagree with it; it moves rapidly about and excites antiperistaltic action and vomiting by which it is expelled. The vomiting in acute cerebral affections, in commotio-cerebri, and particularly in acute hydrocephalus is of a very peculiar character. When children affected with these diseases are turned over upon either side or set upright, then suddenly, without their becoming thereby unpleasantly affected, if they are otherwise in possession of their faculties, a gush of mucolement, white or yellowish-green water will come out of the mouth, after which without suffering any retching or nausea they will take to drink again, or continue to sleep. All cases should therefore be carefully examined and closely observed whether nausea and retching precede the vomiting or not. When these symptoms do not precede, then we have to deal with very serious cerebral vomiting, from which the vomiting of healthy nurslings first spoken of, and which also occurs without retching makes the only exception. (Vogel).

Pathology.—This is well given by Jacobi from whose little work, *Infant Diet*, we quote:

“Caseine differs from liquid albumen by coagulating as soon as it comes in contact with the dilute acid of the gastric juice. The milk curdles in the baby’s stomach in the same way that it does in a porringer when a thunder storm has caused its sugar to ferment and generate lactic acid. Upon the nature of the acid thus formed depends some of the principal varieties in the digestibility of the milk. Herein lies the most essential difference between human milk and cow’s milk, and on it depends the frequent indigestibility of the latter. The caseine that has been coagulated by the acid of the gastric juice must be so modified by the pepsine that it redissolves again, or rather decomposes into two or three substances of which some are soluble, and others are not.

“The soluble products of modified albuminoids are called peptones; the insoluble, parapeptone. This latter passes into the intestine to be digested. During the digestion of milk, a substance is formed intermediate between the caseine and the peptone, called metapeptone. The peptones dissolved in the gastric juice, cannot be precipitated from it when its acidity is neutralized by the addition of an alkali. This, as we have already said is the very peculiarity which distinguishes the solution of albuminous substances in gastric juice from their solution in ordinary acids that do not contain pepsine, for from these they are readily precipitated.

“The metapeptone destined ultimately to be converted into peptone, also remains dissolved when an alkali has been added, to the solvent gastric juice; but if an excess of acid be added, it immediately precipitates. It is precisely this precipitation by an excess of acid which is

a frequent cause of vomiting in babies at the breast. The curds they reject in such abundance shortly after nursing, consists of metapeptone. They do not therefore result from the first coagulation of the milk, but from a precipitation of that which has been partially digested.

"The parapeptone or the insoluble substances formed at the same time as the peptone, is never changed into peptone, but precipitated as soon as the acidity of the gastric juice begins to diminish, as it always does toward the end of digestion. The acid becomes saturated by the substance it has attacked, and can only retain in solution those which have been rendered permanently soluble by the pepsine.

"The parapeptone therefore gradually accumulates in the stomach and finally passes into the intestine, where its digestion is completed.

"The longer the parapeptone stays in the stomach, the more insoluble it becomes; and if it stays too long it will become changed into still another substance of the consistency of soap and called dyspeptone.

"This constitutes a second kind of curd, which irritates the stomach much more than the metapeptone, giving rise to an excessive secretion of acid, (lactic, hydrochloric, butyric, etc.,) just as a stone would do.

"This acid is not gastric juice, for it contains no pepsine, it cannot therefore digest; it only coagulates all the coagulable material into firmer clots, and these, after much pain and disturbance, are finally rejected by vomiting. This vomiting is therefore of different origin and of much greater severity than that which occurs in the early stages of digestion very soon after the child has taken the breast. The first results from the precipitation of the metapeptone, by a slight excess of acid, that is, when there is only a little more acid in the stomach than can be saturated by the food it digests.

"This may occur with little variation from perfect health; the baby vomits, yet shows no sign of discomfort. But dyspeptone is only formed when the curds first coagulated are so tenacious that they can only be slowly redissolved.

"The digestion is slackened, the insoluble substances, parapeptones, do not pass readily into the intestine, and staying too long in the stomach, becomes the more indigestible dyspeptone.

"There is therefore a true indigestion, with all its symptoms and consequences. The slight excess of acid, consequent precipitation of metapeptone, and easy vomiting, may be occasioned by first, an excessive secretion from the mucous glands which mucus readily ferments and then decomposes to much sugar and salt, so that too much lactic, acetic, and hydrochloric acids are generated.

"Some children, those called "lymphatic" or 'scrofulous,' are especially predisposed to this excessive secretion, not only in the stomach, but on all the mucous membranes, as the eyelids, nose, bronchial tubes.

"The milk may contain too much caseine for the amount of water. Too little soluble material will be absorbed from the stomach in the

first time of digestion to furnish enough pepsine to transform all the casein in the second time. There will be therefore, too little pepsine in proportion to the acid of the gastric juice, or, in other words, the acid will be in slight excess.

"The total amount of milk may be in excess, or the child may have swallowed more than its stomach is able to furnish pepsine enough to digest. The facts we have mentioned in regard to the anatomy of the stomach, and the small development of its fundus or peptic gland portion, show why the pepsine is so much more liable to be deficient in the gastric juice than the acid. Excessive feeding in babies nearly always means too frequent feeding, and in babies at the breast, this determines a special cause of vomiting. It is rather singular, but a well proven fact, that the longer the milk remains in the breast, the more watery it becomes.

"Conversely, when milk has recently been secreted under the stimulus of suction at the nipple, it is much richer in solid constituents, especially in caseine and butter. A baby that nurses too often, is thus exposed to a special cause of indigestion. The food is rendered more concentrated and difficult of digestion, at the very time the digestive powers are weakened by excessive use. A new born infant should not be nursed oftener than once in two hours, and the daily meals of a child of eight or ten months should not exceed five in number. It often suffices to render the meals even less frequent, to allay vomiting caused by too rich milk. All the above conditions may be present when the child is at the breast, and thus the first kind of vomiting is quite as frequent in nursing children, as in those brought up by hand. But the indigestion occasioned by the stony masses of dyspeptone, is much more often seen when children are fed upon cow's milk.

"The caseine of cow's milk is more abundant than in human milk, and it coagulates in much firmer clots which resist disaggregation for a longer time. There is also less sugar in the milk, so that one source of acid, (lactic) is curtailed, and the acidity of the gastric juice diminished. On the other hand, there is a larger amount of butter, which is quite indigestible in the stomach, and which, if retained there by a slow digestion is liable to decompose, and generate butyric and other fatty acids. These are of little, if any use for acidifying the gastric juice, while on the other hand, they help to coagulate the casein into tougher masses. We have already shown that the dyspeptone which finally results from this prolonged digestion irritates the stomach, giving rise to a secretion of acid out of all proportion to the pepsine, and constituting therefore, no true digestive fluid. The irritation may be intense enough to occasion a catarrh of the stomach or a congestion of its lining coat, accompanied by excessive mucus secretion. By this, the elaboration of pepsine in the peptic glands is diminished, for when there is congestion the blood in the vessels stagnates instead of circulating rapidly to bring new material.

"For the same reason absorption from the stomach is checked, thus

further diminishing the supply of pepsine, and finally impairing the general nutrition of the body. Or, again, the dyspeptone itself may decompose and generate fat and fatty acids. It will pass the pyloric orifice of the stomach quite unprepared for intestinal digestion, and irritate the intestine so as to occasion diarrhoea.

"The evacuations consist of mucus and fluids secreted from the intestine, the masses of undigested food themselves pass slowly down the canal often causing a temporary obstruction. The slower the progress the more completely is the water absorbed, constipation succeeds to diarrhoea, and the evacuations become hard and dry. Thus pain in the stomach, vomiting, diarrhoea, constipation, general failure of nutrition may be the result of feeding a baby upon rich cow's milk, injurious precisely because so rich. Precisely similar disturbance is caused by human milk when the casein in it is in excess of the normal proportion. With the excess of casein, there is generally an excess of fat globules, and the milk is remarkable for its whiteness and opacity.

"The cardiac half of the stomach is that which contains the gastric glands for the secretion of pepsine, and its smaller size in babies implies that in them there is less pepsine secreted for the digestion of albuminous substances."

Besides the above mentioned forms of vomiting where the milk is curdled, there is another where the milk is rejected, almost unchanged. This generally indicates more serious trouble, for it implies a deficiency in the secretions of the stomach, or else an excess of alkaline mucus dependent on catarrh, which has neutralized the acid. The baby is then ill."

The Treatment of vomiting is both hygienic and remedial. Where it is discovered, the cause must be removed.

In all these cases where the casein of milk passes to the condition of dyspeptone, and remains with water or some watery liquid undigested, the milk must be diluted. This dilution acts in two different ways. In the first place, it favors the absorption of a soluble substance into the blood, and thus provides for the secretion of pepsine to digest the insoluble, the casein. In the second place, it dilutes the acid of the gastric juice and thus prevents it from coagulating the casein too firmly.

In a word as might be expected, the addition of water to milk helps the digestion in precisely the way that the water originally contained in the milk is intended to do. When the child is fed by hand, of course the diluting fluid is easily added to the milk in the bowl. Where it is at the breast, the same end is reached by giving a tablespoonful or more of this fluid just before nursing. Instead of plain water it is preferable to use some substance, which, by its physical

consistency, is able to hold the casein clots in suspension, thus protecting the lining membrane of the stomach from irritation, while they are being prepared for dissolution.

Thus may be mixed quite thin and transparent mucilage with (boiled and skimmed) cow's milk, and added the desirable quantity of sugar and salt or soda.

With the casein of this mixture the gastric juice will get into very slow contact, indeed, thus producing a looser, because a more gradual and interrupted coagulation, on which the digestive liquids and the persistaltic motion of the stomach have a better opportunity to exert their influence.

"Looking for a substance, which, while fulfilling that object, is absolutely indifferent, from a chemical and physiological point of view, it is gum arabic. Its decoction, therefore, as it is not influenced by the digestive liquids, and is not absorbed, acts mechanically only.

"If I meant to write a eulogy on gum arabic, I should but add, that its unpretending and unaggressive nature, renders it particularly fit for an addition to children's food, when, in more advanced years also, their irritated intestines require a soothing addition to the necessary nutriment." (Jacobi.)

Barley or rice water well corked, is quite as good, if not better, for they are nutritious.

The remedies for idiopathic vomiting are few. Complicated cases may need other remedies. The whole case must be individualized.

Regurgitation or vomiting of milk in infants. *Æsthusa, Bryonia, Calcarea, Cina, Jodium, Ipecacuanha, Lycopodium, Nux vomica, Silicea, Sulphur.* The characteristic indication for these remedies will be found in full in the therapeutics of Indigestion, Gastritis and Enterocolitis.

In vomiting of ingesta in older children. *Calcarea carb., Chamomilla, China, Ipecacuanha, Iris, Lycopodium, Nux vomica, Phosphorus, Pulsatilla, Sulphur, Silicea.* For special indications see Indigestion.

Bilious vomiting call for Arsenicum, Bryonia, Chamomilla, China, Ipecacuanha, Mercurius, Nux vomica, Pulsatilla, Sepia, Veratrum.

Fœcal vomiting indicate chiefly Belladonna, Nux vomica, Opium, Plumbum.

Vomiting of blood. *Arnica* may be needed if the child has been injured. *Arsenicum*, vomiting immediately after eating or drinking, and the child seems weak and much exhausted. *Ipecacuanha.* Persistent nausea, with vomiting of blood. *Nux vomica.* Constipation. Violent vomiting of bright red blood.

INDIGESTION.

Definition.—By the term indigestion, is meant, that condition of the stomach in which its function of digestion is disturbed or suspended, independent of inflammation or other diseases of the organ, appreciable by our senses.

Frequency.—It is a very frequent affection during the whole period of childhood, and is one of great importance on this account, and from the fact of its laying the constitution open by the debility and cachexia which it produces, to various secondary affections. In our description of the disease, we shall distinguish between the forms which occur during infancy, and after the completion of the first dentition, following Meigs and Pepper in the main.

Causes.—The principal causes of indigestion in infants are : (1). An unhealthy state of the milk of the nurse. (2). The use of artificial diet, and (3), an impaired condition of the digestive function, which disables the stomach from digesting even the most healthful aliment.

The milk of the nurse may be too old for the child, for it has been found that a breast several months old, sometimes, though not always, disagrees with a young infant, in consequence no doubt of the milk containing more casein and salts at that time than immediately after parturition. The breast-glands may continue to secrete colostrum for weeks or even months after parturition, and when this is the case the child is almost sure to suffer from indigestion and diarrhoea. The milk may be unwholesome because the nurse is in bad health, or because her diet is not properly regulated. That the diet of the nurse affects her milk, we have no doubt, although this has been denied by some persons.

Children are apt to suffer from indigestion, attended with vomiting, acid secretions, colic, and diarrhoea, in consequence of the nurse having indulged in a very rich diet, and particularly in vegetables and fruits. It is not meant to assert that all nursing women should abstain from fruits, or even live on a very simple diet, for some make use of the richest food, and eat abundantly of all kinds of vegetables and fruits, without the least, apparent injury to their milk. But there are others who cannot do this without occasioning indigestion in their infants, either because their milk-glands extract something hurtful from such food, or that their children are unusually susceptible to the action of the materials absorbed from that kind of food.

Again, it is clearly proved, as we know, that the milk of the nurse is affected by her moral condition. Children suffer greatly, and even perish from taking the milk of a nurse who had just before undergone a fit of violent anger, as we have seen. The depressing moral emotions, as anxiety, grief, fear, and despair, are well known to affect the milk secretion, in such a way as sometimes to occasion indigestion.

The use of artificial diet for infants, or as the expression, "bringing up by hand or on the bottle," is by far the most frequent cause of indigestion during infancy. Very many children with whom this is attempted, die of indigestions, chronic diarrhoeas, gastritis, enterocolitis, and thrush. Unless the nurse or mother is very judicious, few escape frequent attacks of one or other of the diseases just named. Much depends, no doubt, on the selection and preparation of the food. It may be stated as a well-established fact, that a diet consisting wholly or in great part of farinaceous substances, very rarely fails to disagree with the young child, and to produce indigestion and other disorders of the digestive system, which often prove fatal, while one in which cow's milk enters as the principal ingredient, though infinitely inferior to the natural aliment, and often productive of indigestion, is far less injurious to infants.

A third cause of indigestion is the absence or loss of the digestive power of the stomach, independent of the nature of the food. This is a condition similar to the dyspepsia of the adult. It may be congenital or may result from causes brought into action after birth. It often remains as a consequence of previous indigestions from improper or excessive feeding. It exists during the invasion, course and convalescence of various diseases. Dentition frequently diminishes or impairs the tone of the digestive function, so that the child is often unable, during that process, to digest aliment which had agreed with it perfectly well at other times.

The causes of indigestion in childhood, *i. e.*, after the completion of the first dentition, are congenital feebleness of the digestive function; the want of power of that function, which remains often for years in children reared upon artificial diet, and in those who have been debilitated by frequent attacks of disease of any kind; the habitual use of improper diet; the eating of crude, indigestible food; the process of the second dentition; the want of due exercise in the open air; residence in large cities; and undue exercise of the mental faculties in the education of the child.

Symptoms.—The symptoms of indigestion will first be described as it occurs during infancy, and secondly as it occurs during childhood, or after the completion of the first dentition.

Infantile indigestion may be advantageously considered under two heads : as occasional or accidental, and as habitual. By the former is meant that which occurs in a healthy infant from a transient cause, as repletion ; a momentarily unhealthy state of the milk from some imprudence on the part of the nurse as to diet, from a moral cause, or from sickness ; and that which depends upon the passing influence of dentition. By habitual indigestion, is meant that form of the affection which is long continued in consequence of a persistence of the cause.

The symptoms of *occasional* or *accidental* indigestion in infants are : Paleness and contraction of the face ; restlessness and peevishness ; moaning and crying, or in some cases, screaming ; nausea shown by excessive paleness, often by very great languor, and by occasional retching, which may either subside without vomiting, or as more frequently happens, terminate in that act ; flatulent distension and hardness of the abdomen, especially in the epigastric region, often accompanied with eructations ; and in many of the cases simple diarrhoea. These symptoms usually come on soon after nursing freely, or after a very hearty meal of artificial food, in a child previously in good health. The attack seldom lasts more than a few hours, or one or two days. The vomiting which almost always takes place, and which relieves the stomach from the offending cause, very often accomplishes the cure.

Habitual indigestion in infants causes a train of symptoms which are different from, and much more severe than those just described. Of these the most important are : Frequent attacks of nausea and vomiting, and of simple diarrhoea repeated for days, weeks, or months in succession ; paleness, or some other unhealthy tint of the cutaneous surface ; continual restlessness and discomfort, with fretting or crying, particularly in the after part of the day and during the evening and night, in place of the natural ease and quiet of a healthy infant ; constant fits of the most violent screaming from colic, sometimes lasting for hours ; dull and languid expression of the countenance, or else an uneasy, contracted look, like that produced by continued suffering ; more or less emaciation ; failure of the natural growth in stature and size, so that the child is small and puny for its age ; want of calorific power, causing the child to suffer unusually from cold, as

shown by frequent coolness of the hands and feet; irregular appetite, which requires to be tempted by frequent changes of the food, or more or less complete anorexia; and lastly, the various symptoms which indicate an impoverished state of the blood and bad nutrition. In some cases there are added to the above symptoms, those of gastritis or entero-colitis, to be hereafter described. Indigestion probably seldom proves fatal in infants, except from the occurrence of some inflammatory complication, as for instance, one of the diseases just named, or acute disease of some other principal organ.

Indigestion in children who have completed the first dentition may, as in the case of infants, be occasional or habitual. Occasional indigestion occurs in strong and vigorous, as well as in more delicate subjects. The attack generally begins within a few hours or a day after the child has eaten some indigestible substance, with languor and chilliness in older children, and with languor and peevishness in those who are younger; after which there is headache, pain in the stomach in most of the cases, and very often a disposition to somnolence. If the child is attacked with vomiting soon after the appearance of these symptoms, and ejects the offending material, it will often seem perfectly well from that time. If, however, this does not take place, fever, sometimes of a violent character, is almost certain to make its appearance. The pulse becomes very frequent, rising to 120, 130, or even higher, and being full and resisting; the skin becomes flushed, dry, and very hot; the appearance of the tongue is not generally changed early in the attack; there is considerable thirst; the child restless and uneasy, tossing from side to side, or lies in an uneasy sleep, attended with frequent starting and jerking of the limbs or crying out; the abdomen is natural, or hard and distended over the epigastric region. When the symptoms just described make their appearance suddenly, *i e.*, in the course of a few hours, in a child two, three, or five years old, after it has eaten some indigestible substance, there is reason to fear an attack of convulsions. The probability of the occurrence of this accident is great in proportion to the earliness of the child's age, its plethora, and the impressibility of its nervous system. The attack is particularly to be apprehended, and should be carefully guarded against, whenever the fever is violent, when there are urgent complaints of headache, when the restlessness and agitation are very great, or when there is somnolence, with frequent startings or twitchings of the muscles. Convulsions sometimes occur without any previous warning, or after such slight signs of dis-

order as would fail to produce uneasiness in the parents or attendants.

The symptoms produced by occasional indigestion generally continue until nature relieves the stomach by vomiting or diarrhea, or until the remedies proper in the case have been administered. It happens not unfrequently that symptoms of gastric or intestinal disorder remain for some days after the violence of the attack has subsided, and in some instances the disturbance is so great as to occasion gastritis, enteritis, entero-colitis, or even dysentery.

Habitual indigestion in children who have completed the first dentition, is not at all an uncommon affection. It is a condition analogous to, if not identical with, the dyspepsia of the adult. The symptoms of this form are the following: The general appearance of the child is delicate, as shown by a pallid or sallow tint of the skin, instead of the ruddy complexion of health, by thinness and want of proper development of the limbs and trunk, and by softness and flaccidity of the muscular tissues. There is an habitual air of languor and listlessness, with absence of the usual gaiety and disposition to play natural to the age, and the child often complains of being tired. The appetite is feeble or uncertain, being sometimes absent, and at other times too great; or it is peculiar, the child being willing to eat of dainties, but refusing food of a simple character. The tongue presents nothing peculiar. It is however more frequently somewhat furred than clean and natural. The temper is usually irritable and uncertain. The child rarely sleeps well; on the contrary, the nights are restless and much disturbed, the sleep being broken and interrupted by turning and rolling, by moaning or crying out, and by grinding of the teeth. These latter symptoms, together with the picking at the nose, which is a frequent accompaniment, are almost always referred by the parents and nurses to worms, and it is often impossible to convince them to the contrary, even though frequent and violent doses of vermicifuges have failed to show the existence of entozoa. The state of the bowels is uncertain. In some instances they are very much constipated, in others they are inclined to be loose, and when this happens, the stools are often lienteric. In others, again, constipation and diarrhoea alternate. The abdomen is usually natural, or somewhat enlarged from flatulent distension; complaints of pain are not uncommon. This form of indigestion, like dyspepsia in the adult, is generally a very chronic affection, sel-

dom lasting less than several weeks or months, and sometimes for years.

Diagnosis.—The occasional indigestion of infants is not likely to be mistaken for any other complaint. The suddenness of the attack, the character and quantity of the matters ejected from the stomach, the absence of symptoms indicating the invasion of any other disorder, the short duration of the symptoms and the rapid recovery, all render the true nature of the case very clear. That which occurs in older children, on the contrary, is not so easy of diagnosis. In many cases the invasion is not unlike that of scarlet fever or diphtheria. The vomiting and frequency of the pulse, the great heat of the skin, and in some cases a sore throat and a certain suffusion of the integument dependent on the activity of the circulation, all render the case doubtful for some hours, or for a day, after which time the difficulty ceases, from the development of the symptoms peculiar to each disorder. A few cases of simple angina are mistaken for indigestion, owing to the absence of complaints of sore throat, and the neglect of the physician to examine that part. In such cases the vomiting and sudden attack of fever are ascribed, for the want of another mode of explaining them, to gastric derangement. The diagnosis can be made only by examination of the fauces. The diagnosis of indigestion accompanied by convulsions will be considered in the article on the latter affection.

The habitual indigestion of infants is not likely to be confounded with any other disease. The absence of fever, of tenderness of the abdomen on pressure, or other acute symptoms, all indicate the dependence of the disorder on functional distress of the stomach. The same remarks apply to this form of the disease occurring in older children. Nevertheless, we should never neglect to make a careful examination, both of the physical and rational signs, of all the important organs of the body, as it sometimes happens that latent disease of some one of them is the cause of the gastric difficulty.

Prognosis.—The prognosis of occasional indigestion is nearly always favourable. It is rarely a dangerous disorder, unless accompanied by convulsions, or some other signs of violent disturbance of the nervous system. Under the latter circumstances, the prognosis should be very cautious, as the termination is not unfrequently fatal in consequence of injury done to the nervous centres. It should be recollected also that this form of indigestion sometimes becomes the exciting cause of inflammation of the stomach

or intestines, in which event the prognosis will be that of those diseases.

Habitual indigestion in infants is a serious complaint, and ought always to awaken the solicitude both of the physician and parents; especially in the early summer, for though a simple functional disease of the stomach is not probably often fatal, it is exceedingly apt to prove so by the induction of gastritis, chronic entero-colitis, or thrush, or by its laying the system open to other diseases, and rendering it less able to withstand them, should they happen to occur. In older children it is not so dangerous a malady.

Treatment, Hygienic.—If the symptoms of the disorder occur in a child at the breast, the milk should be carefully examined. If found to possess decidedly, unhealthy qualities, the nurse ought to be changed, unless the milk cannot be changed by food or remedies as recommended under "Food." It needs usually, no other remedy.

If fed wholly or in part, it is essential to regulate the diet to suit the state of the digestive function. Milk ought in all cases to form the basis of the food, unless it has been found by patient trial to be absolutely repugnant to the stomach. Meigs found that infants who had been thought incapable of digesting cow's milk, could do so very readily when it was very much weakened with water. The usual proportions for an infant of a few months old, are half and half, or two parts milk for one of water, to which sugar of milk is added. When these are found to disagree, it is well to try three, or even four or five parts of water to one of milk, and if the stomach digest this, as it often will, the proportion of milk may be slowly and cautiously increased to the usual standard. If we conclude that milk cannot be digested by the child, it is best to try cream. Of this, one part to three or four of water, may be given. When neither of these can be taken, some of the dextrine or farinaceous substances may be tried. Meigs is of the opinion, however, that these articles prepared with water alone rarely agree with children when they are continued for any considerable length of time. Some infants of six or eight months old it may be remarked, who cannot digest more than very small quantities of milk, will take and digest well, very delicate broths made of chicken or mutton or small quantities of the lightest meats, as mutton, chicken, or very tender beef, minced up extremely fine, and given by teaspoonfuls.

In cases of this kind Meigs found a diet consisting of gelatine, milk, and arrow-root, prepared in the following manner: A piece of gela-

tine two inches square soaked in half a pint of cold water and then boiled till it dissolves. Mix arrow root into a paste with cold water, add the milk and the paste to the gelatine as it stops boiling. Before removing from the fire add the cream. For an infant less than a month old, the preparation should be three or four ounces of milk, half an ounce to an ounce of cream and a teaspoonful of arrow-root. For an older child the milk and cream may be increased to half or two-thirds milk, and one or two ounces of cream, to suit better than anything else. He met with several children, and with two in particular, whom it was necessary to feed to the amount of a pint or a pint and a half a day, in addition to being nursed occasionally. They could take neither milk and water, cream and water, milk and arrow-root, oatmeal gruel, rice gruel, nor indeed anything that was tried, without vomiting, colic, and severe diarrhoea, who digested perfectly well and thrived admirably upon this preparation. He has now used it more than twenty years, and have recommended it for a great many children, and does not hesitate to say that it agrees with a larger number than any other diet he ever employed or seen employed.

The diet of older children laboring under chronic weakness of the digestive function is as important as that of infants. Two chief ends should always be borne in mind in selecting it: Digestibility and nutritiousness. The former is all important, for without it the stomach, constantly irritated by improper food, has no chance of regaining its tone, while the latter is necessary in order to sustain the strength of the child, and allow it to carry on its growth. We have generally found it most prudent, and often really necessary, to specify as to the substances to be given at each meal. The morning and evening meal ought to consist of bread and milk, mush and milk, or of milk, warm water and sugar (called children's or cambric tea), and bread and butter, and nothing else in most of the cases. It is sometimes proper to allow a soft boiled egg, particularly if the child be very fond of it. The dinner ought to consist of light broths containing rice, with bread or toast, or of the plain meats, as mutton, beef, chickens, turkeys, birds, or fine game. No vegetables ought to be allowed in most of the cases except rice, as all others, even the potato, are very apt to disagree. Potato is more digestible when roasted than when boiled. If the child require anything between breakfast and dinner, it may have what is allowed at breakfast, or dry bread, and nothing else. There are various articles of diet which should be absolutely forbidden, amongst which are hot and sweet

cakes, and hot bread of all kinds; sausages, not unfrequently given to children in this country; corn-beef, ham, veal, pork, goose, ducks, fish; all manner of dessert, except rice pudding, or curds and whey, often called junket; sweetmeats, candies, fruits, except some of our finest summer ones; and to conclude, everything which long observation and experience have shown to be unsuitable for a dyspeptic stomach. (Meigs and Pepper.)

It is sometimes very difficult to find anything to agree well with the child. Case of a child three years old that came under Meigs' observation, neither milk, bread, nor meat, could be taken. The caseum of milk seemed to be absolutely indigestible, as it would be rejected from the stomach many hours, or even a day or two after the milk had been taken, in the form of masses of dry, fibrous cheese, of an oblong shape, nearly or quite as large as a peach-stone. After trying various articles he found that the child digested raw oysters, soda biscuit, and rennet-whey, and upon these articles alone she lived for two weeks, at the end of which time she had improved so much as to be able to take the white meat of chicken very finely minced, and gradually regained her previous health. It is sometimes difficult to get these children to take food of any kind. Meigs records one. In one case the author found that minced raw beef sweetened, the only article of food that would be taken. On this the child lived two weeks, then gradually took other food. In another instance nothing could be taken and the child was only saved by rubbing it once a day, with *Sweet oil*. In a week it began to call for soup on which it lived for a whole month, then gradually enlarged its bill of fare.

Therapeutics.—In addition to the diet, the administration of the properly indicated remedy, will soon change the scrawny, fretful and ill-nourished infant into a plump and happy one.

Hartmann says: "If the gastric derangement should have been caused by a simple overloading of the stomach, it will in most cases be sufficient to deprive the child of its more substantial nourishment, and if it should want to have a little food in a few hours, give it a little gruel or a thin slice of bread and butter. If the child should be sick at the stomach and want to vomit, the vomiting may be facilitated by small quantities of black coffee. By this means the pressure and sense of fulness at the pit of the stomach, and the distention of this region, will likewise be removed. After the contents of the stomach have been removed by means of the coffee, it may be necessary to control the remaining symptoms by means of *Pulsatilla* 12th, *Ipecacuanha*, or *Nux vomica*, or *Bryonia* 12th. *Antimonium crudum* 6th, *Arsenicum* 30th.

" In most cases, however, the gastric derangement is not caused by overloading the stomach, but is the result of a natural debility of the digestive organs. How frequently does it happen, for instance, that children's stomachs are deranged by a little fruit or cold water; for such derangements, which are sometimes very obstinate, *Pulsatilla* and *Arsenic* are the remedies in some, and *Bryonia* and *Carbo vegetabilis* 30th, in other cases.

" If the stomach should have become deranged by abuse of coffee, *Chamomilla*, *Nux vomica*, *Ignatia*, *Pulsatilla*, *Coccus* will restore the tone of this organ, and if by abuse of chamomile tea, *Pulsatilla*, or *Nux vomica*, or *Ignatia*. For a gastric derangement produced by cold, *Coccus*, *Belladonna*, *Ipecac*, and *Dulcamara* 6th, are the principle remedies. If occasioned by excessive heat, *Bryonia* will remove it. If the derangement should assume an obstinate character, there is generally a constitutional debility of the digestive organs, which requires to be treated with repeated doses of *Hepar sulphuris* 12th, and *Sulphur* 30th, at suitable intervals.

" If the gastric derangement should be characterized by loss of appetite, loathing and other symptoms, such as have been described above, *Ipecacuanha* will either effect a cure or so far modify the symptoms as to enable a dose of *Antimonium crudum* to effect a cure. If the vomiting and diarrhoea should continue after the *Ipecac*, *Pulsatilla* may be exhibited, and if there should be a good deal of prostration, *Arsenic*. Should the vomiting be attended by constipation, *Nux vomica* will be the best remedy, sometimes *Bryonia*, *Chamomilla*, *Veratrum*, *Mercurius*, *Tartar emetic*, and even *Hepar sulphuris*, and *Carbo vegetabilis*, may be used in such a condition of the stomach.

" If the gastric derangement should be complicated with bilious symptoms, and these latter should prevail, the following remedies may be resorted to in the commencement: *Mercurius sol.*, *China*. *Digitalis* 12th, *Chamomilla*, *Nux vomica*, *Sulphur*, *Rheum*. All the other remedies which have been mentioned for gastric derangements, may likewise have to be used.

" If the mucus symptoms prevail, all the foregoing remedies may have to be employed, to which we may add: *Belladonna*, *Spigelia*, *Cina*, *Acid sulphuricum* 6th. These various conditions are not as strictly limited in nature as they appear in the books; the symptoms are frequently mixed up, and their treatment requires a more competent knowledge of the resources of our art than can be conveyed in a treatise of this kind."

The following are a few of the remedies and symptoms, collected by Guernsey, with additions:

Aconite.—The infant has a dry, hot skin, is sleepless, restless, cries much, bites its fists, and suffers from green watery diarrhoea. A dose of *Aconite* cures all these difficulties in a few days.

Aethusa cynapium.—The child throws up its milk soon after nursing, with great force, suddenly, then falls asleep as if from exhaustion to awake for a fresh supply. Milk seems not to agree with the child

which is shown by colic, diarrhoea, constipation and aphtha in mouth

Arsenicum.—The food passes undigested, the stools are offensive; much crying during and after nursing, or as soon as the child begins to take food. Emaciation; restlessness.

Baryta carb..—Useful in colic of dwarfish children, those who do not grow.

Belladonna.—The child cries out suddenly, and after a while it ceases crying as suddenly as it began, and appears as if nothing had been the matter. Starting, with jerking of muscles; the child cries and whines a great deal.

Borax v..—The child cannot bear a downward motion, not even during sleep. It cannot be put down out of the nurse's arms; it awakens and cries on the attempt being made. It has much colic and indigestion.

Bryonia.—The child must evidently be kept very still in order to relieve its colic and other sufferings. The stools are dark, dry and hard, as if burnt.

Calcarea c..—In children of leucophlegmatic temperament, with large fontanelles. Profuse perspiration of the head; white chalk-like stools. Long and continued crying. Inguinal hernia seems to be the cause, which *Calc. c.* will remove.

Chamomilla.—Very irritable and fretful—must be carried. Distress after nursing. Sleepless; starting and jerking while asleep. Stools smell like rotten eggs, and are green, chopped, or consist of white and yellow mucus.

China.—Colic comes on at a certain hour every afternoon.

Cina.—The child is always cross and troublesome when awake. It will not sleep unless it is kept in constant motion. It is seldom still and quiet whether sleeping or awake.

Coffea.—Great restlessness and wakefulness, with nervous excitability; much crying; hot skin.

Colocynth.—The child writhes in every possible direction, doubles itself up and seems in great distress; it cries very hard.

Dulcamara.—When the child gets worse at every cool change of the weather.

Hepar.—Colic, with dry, rough, pimply eruptions, that itch very much.

Ignatia.—When trouble seems to arise on account of grief of mother or nurse.

Ipecacuanha.—There is much sickness of the stomach; the more

constant the nausea the more certainly will *Ipecac* be indicated. Fermented stools.

Iris versicolor.—Protracted nausea and frequent vomiting of sour water, the vomiting being accompanied with pain; belching of wind from stomach with considerable force, or profuse emission of flatulence; colic and diarrhoea; colic and diarrhoea, with bilious stools and sick stomach.

Jalapa.—When the child is "good" all day, but screams and is restless at night.

Lycopodium.—The child always cries and screams before passing water, and is relieved immediately afterward. Red sand is found in the diapers. Much rattling and rumbling in the abdomen.

Magnesia c.—Very much colic, which is finally relieved by a green liquid stool. This occurs very many times day and night.

Mercurius.—Much colic, which is relieved by a slimy, bloody stool, with straining.

Nux v.—Much colic, with constipation. The child cries much, draws its feet up, and then kicks them out again, etc. Its mother lives on highly seasoned and stimulating food.

Opium.—The whole trouble seems to have arisen from fright of the nurse.

Podophyllum.—An attack of colic at daylight every morning. Severe colic causing an absolute retraction of the abdominal muscles.

Pulsatilla.—The child always gets worse towards evening and remain so till towards morning.

Rheum.—Much colic, with very sour stools.

Senna.—The child cries terribly, and seems full of incarcerated flatus; it even turns blue all over during its cries. Sometimes it has frequent and bloody stools.

Silicea.—Colic with difficult stools; they slip back into the rectum when nearly evacuated.

Stannum.—The child's colic is relieved by pressing firmly upon the abdomen. When it is crying with colic, relief is at once obtained by carrying it with its abdomen resting on the point of the nurse's shoulder.

Staphysagria.—The child seems to be suffering from a fit of chagrin or indisposition of the nurse. Indicated in the sufferings of pot-bellied children, with much colic and humid scald head.

Sulphur.—The child has a tendency to excoriations wherever the

skin is folded upon itself. Pimply eruptions filled with pus. Redness about the anus after an evacuation. This remedy often cures the colic and derangement of the stomach of infants.

Veratrum.—Terrible colic and coldness of the forehead. Very cold feet with the colic. The suffering causes a cold sweat to stand upon the surface, particularly upon the forehead.

BULIMIA. POLYPHAGIA.

Fames canina or morbid increase of the appetite is often met with in children, and may be acquired through bad habits and a depraved rearing, but is oftener a symptom of various morbid conditions, as indigestion, gastric catarrhs, above all, of intestinal worms, next of hypertrophy of the mesenteric glands, and of chronic cerebral affections. The ravenous hunger coming on after acute diseases, particularly typhus fever, does not belong here, it finds its physiological explanation in the rapid replacement of the adipose tissue that has been lost. So also of that bulimia which originates in general good health, and without any disease of the organs, must an especial disposition be assumed; for, although very many children are constantly urged by their irrational parents to eat, and incessantly stimulated thereto by a change of delicacies, still few are able to acquire this rare condition. In these cases, the objects with which children seek to appease their ravenous hunger always belong to the class of delicate nutriments, but depraved longings, depending upon morbid alterations of the organs, also occur in greediness similar to that in pregnant women. Such children eat raw and bad victuals, and roots of all kinds, and refuse at no time of the day, not even directly after a meal, a slice of stale bread, of which they will consume as much as they can obtain. When this condition cannot be remedied sufficiently early, it becomes chronic, without the children increasing thereby in size and weight faster than those who are more moderate. On the contrary, they generally look pale and anaemic, have frequent evacuations, putrid-smelling stools, and are retarded in growth. At the autopsy, an extraordinarily large stomach, with thickened walls, and other morbid alterations are usually found.

The treatment is successful and rapid if intestinal worms which may be expelled by the various anthelmintics, *Cina*, *Spigelia*, etc., are the cause of the polyphagia; but unsuccessful if, as in atrophic children, the mesenteric glands are collectively hypertrophied and infiltrated, or when a chronic hydrocephalus is the cause of the bulimia. Here

we have to limit our efforts to supplying at least easily-digestible, bland nutriments; it will scarcely ever be possible to diminish them much in quantity.

The principal remedies are : (1), *Calcarea, China, Cina, Iodine, Lycopodium, Petroleum, Phosphorus, Silicca, Spigelia, Staphysagria, Sulphur, Veratrum.* (2), *Conium, Graphites, Hepar, Kali, Natrum mur., Nux vomica, Sabadilla, Sepia.* (3), *Bryonia, Coccus, Hyoscyamus, Lachesis, Magnesia mur., Mercurius, Rhus tox., Squilla.*

Gluttonous eating requires one of the following remedies : (1), *China, Cina, Lycopodium, Mercurius, Petroleum, Staphysagria.* (2), *Calcarea, Natrum mur., Silicea, Sulphur, Veratrum.* (3), *Collinsonia, Eupatorium perf., Gelsemium, Podophyllum.*

Hunger after disease or debilitating causes : *China, Veratrum, or Calcarea, Natrum mur., Silicea, Sulphur.*

Sudden hunger with faintness require : (1), *Calcarea, China, Cina, Hyoscyamus, Mercurius, Sabadilla, Silicea, Spigelia.* (2), *Conium, Magnesia, mur., Natrum mur., Nux vomica, Petroleum, Sepia.*

Canine hunger and the food readily thrown up again : (1), *Bryonia, Nux vomica, Phosphorus, Pulsatilla, Silicca, Sulphur.* (2), *Calcarea, Cina, Hyoscyamus, Lycopodium, Natrum mur.*

Canine hunger when the food is passed undigested as soon as taken into the stomach : (1), *China, Phosphorus, Veratrum.* (2), *Bryonia, Calcarea, Conium, Mercurius, Sulphur.*

Canine hunger with worms : *Hyoscyamus, Mercurius, Sabadilla, Silicea, Spigelia.*

Jahr (Forty Years Practice), says : "For canine hunger *Calcarea, Lycopodium*, and no less *Silicea* have shown themselves the most efficient remedies in my hands. For the excessive hunger after typhus, *Veratrum alb.* For the voracious appetite which torments those who are otherwise healthy, I have derived the best effect from *China, Cina Veratrum album*, and sometimes from *Mercurius, Sepia*, and *Sulphur*. For nocturnal hunger, *China* is likewise an excellent remedy. If such attacks are accompanied by waterbrash and nausea, no remedy surpasses *Silicea*. and in the case of children (young), *Calcarea.*"

Nux vomica has been the chief remedy indicated in the practice of the author. It is a good remedy to arouse, as well as to control the appetite.

CONGESTION.

Passive congestion of the stomach is described among the diseases of this organ by Billard; but as Smith well remarks, it is a pathological state of little importance in itself. It occurs in new born infants,

asphyxiated at birth and with difficulty resuscitated. In these cases there is generally intense capillary congestion throughout the system. The mucous membrane of the stomach is injected, but not more than that of the stomach or intestines. If circulation and respiration are fully established, this injection of the capillaries subsides.

No treatment is required, except measures to promote the circulatory and respiratory functions. In cyanosis and atelectasis there is often general congestion of the capillaries of the systemic circulatory system, on account of the obstruction to the flow of blood through the heart in the one disease and through the lungs in the other. There is in these cases passive congestion of the stomach, but not more than of the other organs. For remedies see Gastritis.

GASTRIC CATARRH.

Catarrh of the mucous membrane of the stomach, or gastritis catarrhalis, is met with in the autopsies of many children, who, during life, exhibited no signs whatever of disturbed digestion. When we bear in mind that a bright-red color of the gastric mucous membrane is a *physiological condition* in the new born, it will not be possible to lay very great stress upon the frequently described injections, and still more of the ecchymosis of that mucous membrane, especially as we have no guide whether any, and, if any, what symptoms are produced thereby. Only when a blennorrhœa of the gastric mucous membrane has developed itself, and the profusely secreted mucus is vomited several times a day, are we justified, from a clinical point of view, to diagnose a gastric catarrh. The causes of this affection are as numerous as those which have been enumerated in the previous sections for dyspepsia, vomiting, flatulence, etc.

Symptoms.—The symptoms of such a gastric blennorrhœa are fixed, continuous stomach ache, increased on pressure, permanent distension of the epigastric region, perceptibly increased temperature of the same, and an accumulation of gas within the stomach. Warm or solid nutriments and warm drinks, introduced into the stomach, aggravate the pains; cold drinks, particularly cold milk, relieve them. True, the food is frequently thrown up, but upon that alone the diagnosis of gastric catarrh cannot be based; an emesis of pure, opaque, glairy, or greenish mucus, without much retching, must take place before or some hours after the meal. The nutrition of the child is not much interfered with at first, because, as has been already observed, the food is not regularly thrown up, and the intestinal mucous membrane is still capable of absorption. But in the course of time emaci-

ation comes on. In the cadaver the gastric mucous membrane is found hypertrophied, covered with a thick layer of mucus, its upper surface uneven and warty, a condition that has been called *etat mammelonné* by the French, (see p. 195); but it is only necessary to observe here, that, before a mucous membrane can be called mammellonated, the contracted stomach should have been stretched out to its fullest capacity, for, in the strongly-contracted stomach, every mucous membrane, even the healthiest, will assume a warty appearance. The rest of the symptoms enumerated in text-books, those regarding the pulse, the general condition, the stools, the urine, etc., are not sufficiently characteristic to deserve a place here.

Treatment.—The chief object of the treatment is to regulate the diet, and nothing but cold milk should be allowed for several days. Against the profuse secretion of the mucus, *Nitrate of Silver* has in Vogel's hands proved to be a sovereign remedy. *Argentum* is a valuable remedy, but not the only one. *Antimonium crudum* is also valuable. Consult Food, Indigestion, Gastritis, Gastro-malacia and Vomiting.

GASTRITIS.

Inflammation of the stomach, except, says Smith, when produced by the direct contact of some irritant, is rare in infancy and childhood, independently of disease in some other portion of the intestinal tract. A few cases have, however, been reported in which it was not known that any irritating ingesta had been taken, and in which a careful examination revealed a healthy or nearly healthy state of other portions of the digestive tube. The subjects were, for the most part, young infants. The following is an example related by Billard:

"An infant four days old, remarkable for the color of his face and firmness of flesh, refused the breast and vomited *yellow acid matter*. On the following day the vomiting had increased; legs œdematosus; face pale and pinched; respiration difficult; skin cold; pulse slow and irregular; pressure on the epigastric region produced cries indicative of pain. Third day: General sinking, face thin and expressive of great pain; stools natural. Fourth and fifth days: Condition the same. Death occurred on the sixth day, and an autopsy was made on the day following. With the exception of slight pneumonia, no disease was discovered in any part of the system besides the stomach. The mucous membrane of this organ was intensely vascular near the cardiac orifice and along the lesser curvature. It was also tumefied, and could be easily raised with the nail. In the remainder of this organ there was strongly-marked capilliform injection."

This case is interesting as showing what may happen, though

rarely. A nursing infant is seized with gastritis without apparently having taken any irritating ingestum, and without any other disease of the digestive apparatus. It is probable, however, that in cases like the above, the cause, if ascertained, would be found in the ingestum; perhaps drinks too hot, perhaps elements of colostrum, or pathological elements in the milk, which might produce the disease in young infants in whom the mucous membrane is delicate and sensitive.

Gastritis is not uncommon in infancy in connection with inflammation of the intestines. The latter inflammation is sometimes apparently subordinate to the former, and if such patients die, the fatal result is due mainly to the gastric disease.

Causes.—Gastritis in infants has been in most cases due in great part to the continued use of improper food, of food not suitable to the age of the child, which was therefore, with difficulty digested. Milk, acid or otherwise unwholesome, farinaceous substances, stale, or of an inferior quality, and not properly prepared, drinks too hot or too cold, may be specified among the causes. Therefore this disease is most common in bottle-fed infants, and is comparatively rare in those who receive abundant and wholesome breast milk. Anti-hygienic agencies, apart from the diet, no doubt exert some influence in the production of gastritis as they do of stomatitis. Uncleanliness, residence in damp and dark apartments, and in an atmosphere loaded with noxious gases, produce a condition of system which strongly predisposes to these inflammations, if indeed they may not be enumerated among the direct causes.

Rilliet and Barthez have called attention to the fact that certain medicinal substances given to children occasionally cause gastritis. Smith has observed this effect from the use of *Tartar emetic*, Kermes mineral, *Croton oil*. Gastritis occurring in this way, may or may not be associated with inflammation in contiguous portions of the digestive tube. Many practitioners have also met such cases.

Inflammation of the stomach is thought by some to accompany measles and scarlet fever during the eruptive period, though the proof of this is not decisive. If it occurs, it corresponds with the stomatitis and cutaneous inflammation of those diseases, and disappears as they subside. It is mild, and accompanied by few symptoms.

Age.—It appears that gastritis is rare over the age of six months. On the other hand, it is not uncommon in infants under the age of three months who are deprived of the breast milk. I have met it

chiefly in foundlings fed with the bottle, and having at the same time entero-colitis and often also stomatitis and œsophagitis. In these cases there is sometimes continuous or almost continuous injection and thickening of the mucous membrane, from the lips to near the pyloric orifice of the stomach, and even beyond this orifice in the intestines.

The observations of Valleix show how frequently gastritis is associated with severe attacks of thrush. In twenty-three of his cases the latter disease, in which the condition of the stomach was noted after death, this organ presented inflammatory lesions in seventeen, and in three others appearances which may or may not have been due to inflammation.

Symptoms.—A difficulty exists in ascertaining the symptoms of gastritis from the fact that this disease is generally connected with stomatitis or entero-colitis. Though we may never be able to diagnosticate this affection as certainly as we can croup or pneumonia, still, there are symptoms which arise directly from the gastritis, and with care we may be able to distinguish them from those symptoms which are due to other pathological states. One of the earliest diagnostic symptoms of gastritis is a redness of the tip of the tongue.

If gastritis is acute, pain is present. In the above case from Billard, there were frequent cries, and the countenance indicated much suffering, until the stage of collapse. If there is less intensity of inflammation, and the disease is more protracted, the pain is not so severe, and it may be so slight as not to attract attention. Sometimes there is tenderness, so that pressure upon the epigastric region is badly tolerated. Vomiting is regarded as one of the most constant symptoms. The infant after nursing seems in distress till the milk is returned. There is much thirst, so that it nurses with avidity, if it is not too exhausted or feeble. The dejections may be quite regular throughout the disease, as in the case already related from Billard. There is ordinarily, however, diarrhoea from the presence of entero-colitis. The pulse is sometimes accelerated, and sometimes nearly natural. The emaciation in gastritis is rapid, since not only the milk is in a great measure vomited, but the digestive function, so far as the stomach is concerned, is seriously impaired. The features become wrinkled and senile, the eyes hollow, the limbs attenuated, and the cranial bones uneven. Death occurs from exhaustion.

Anatomical Characters.—Simple gastritis may affect the entire mucous surface of the stomach, or be limited to a certain part. The

part which is most likely to escape is that towards the pyloric orifice. This portion of the organ is sometimes found in nearly or quite the normal state, while the cardiac half or two-thirds are more or less inflamed. The vascularity of the diseased surface is often not uniform. In one place there is simply arborescence; in another intense continuous redness, and between these two extremes, are different grades of vascularity. The mucous membrane is somewhat thickened, softened, and the secretion of mucous increased. Extravasation of blood is not infrequent under the mucous membrane usually in points, and the mucus may be mixed with more or less blood. Small shreds or portions of coagulated milk are often found mixed with the mucus, and attached to the gastric surface. Vomiting soon after eating is an early symptom.

Diagnosis.—In protracted cases, when entero-colitis is present, it is difficult to make a positive diagnosis. Our opinion must then be little more than a plausible conjecture. In the acute attacks we can diagnosticate the gastritis with more certainty. If a young infant affected with thrush is seized with pain, and it vomits often; if emaciation is rapid, and there is no diarrhoea, or diarrhoea not sufficient to account for the prostration; if the buccal mucous membrane, dotted with the points of thrush, presents a dry appearance and the deep red color of severe stomatitis, there can be little doubt of the presence of gastritis. The diagnosis is rendered more certain by signs of tenderness, when pressure is made upon the epigastric region.

Prognosis.—Like other inflammations, gastritis is probably sometimes so mild that it does not add materially to the suffering or danger of the child. This mild form of the disease under favorable circumstances soon subsides. In other cases by the continuance or increase of the cause, the inflammatory process becomes more severe and extensive, resulting even in disintegration of the mucous membrane. Those cases are especially severe and likely to terminate fatally, which are protracted and accompanied by severe thrush, with a dessicated appearance of the mouth, or with entero-colitis. Pain, vomiting, and rapid emaciation in such children, indicate the speedy approach of death. Improvement in the stomatitis or entero-colitis is a favorable indication, but these inflammations may improve without corresponding improvement in the gastritis.

Treatment.—All food or drinks, except those of a bland and unirritating nature, should be forbidden. If practicable, the young infant should take no nutriment, except the mother's milk or that of a wet

nurse. As there is an excess of acid in inflammation of the mucous coat of the digestive tube, lime-water, or better still, *Carbonate of Soda* may be advantageously given in combination with the milk, when bottle-fed.

Arsenicum is one of the chief remedies, *China* cures many cases in the first stage, *Nux vomica* when due to indigestion.

Teste advises, if the stomach is still surcharged with food, or if some poisonous substance has been swallowed, the patient should be made to vomit, either by means of tepid water, or tickling the fauces; after which we may prescribe, according to the circumstances, *Aconitum*, *Pulsatilla*, *Nux*, *Arsenicum*, *Chamomilla*, *Bryonia*, *Phosphorus* or *Causticum*.

Aconitum, if the dominant symptom is a high, full, and frequent pulse, with heaviness of the head, pain in the forehead, and considerable heat in the face and restlessness; especially if the indisposition has succeeded a fright.

Pulsatilla, if greasy food, such as goose or pork, has provoked the indigestion, or if the patient is tormented with frequent sour, and watery regurgitations; if he vomits without effort; if he experiences vertigo, or in short, and above all, if these symptoms occur in the evening and night.

Nux vomica, if the child is of a nervous, dry, and irritable temperament; if the pain at the epigastrium, and the agitation are very intense; if there is constipation and but little sweat; if in short the disease has been caused by coffee, wine, or any other alcoholic drinks, or again by a fit of passion.

Arsenicum, if the gastritis is in consequence of a chill, or of indigestion of fruits, raw roots or herbs.

Chamomilla, if there are bilious vomitings, and especially if the patient is a little girl, or an infant at the breast.

Bryonia, if the indigestion has been produced by cabbage; if the epigastrium is very sensitive to the touch, and if the slightest movement increases the pain, and if there is constipation.

Phosphorus, is indicated when there is a pressing and cutting burning in the stomach — a sensation as if warm gas was escaping from the mouth; ardent thirst: burning in the precordial region; anguish; convulsions of the face; violent chills, or when the limbs are cold, the eyes clear and tearful, the lips pale, the pulse accelerated, small and feeble, the strength prostrated.

Causticum, whose use in the treatment of affections of the stomach, seems to me susceptible of being much extended, is the specific for

suffocative gastritis, a form very rare in children. The symptoms which call for its use are: spasmodyc distention of the epigastrium, with burning and inodorous eructations; bilious coloration of the face; absence of sweat; and even of heat in the forehead and hands; constipation; lastly, tickling in the throat, which provokes a dry cough.

Death occurs from exhaustion, and it is very important that the vital powers should not be reduced. If the child is weaned, the diet at first should be restricted to arrowroot, rice-water, barley-water, or similar bland substances. In advanced stages of gastritis, animal broths with milk, and jellies may be given. See Food and Indigestion.

FOLLICULAR GASTRITIS.

The pathological character of *follicular gastritis* is similar to that of follicular stomatitis. It is an inflammation affecting the gastric follicles and ending in their ulceration. It is not a frequent disease; it occurs in young infants. Billard observed fifteen cases. The symptoms in these patients were similar to those in simple gastritis of a severe form. The emaciation and prostration were rapid, and death occurred early. We can only diagnosticate the gastritis without determining its follicular character. How many recover it is impossible to ascertain, but the disease is apt to be fatal on account of the intensity of the inflammation, not only of the follicles but of the intervening mucous membrane. The treatment is the same as that for gastritis.

GASTRO-MALACIA.

Whether this is a disease or not, no work can be at all completed without a reference to it. Therefore Condie's excellent picture is given which is the best we have seen.

Symptoms.—"In children brought up by the hand, or improperly fed subsequent to weaning, indigestion occasionally occurs, attended by symptoms of considerable severity. There is generally loss of appetite, peevishness, restlessness and want of sleep; the tongue is covered with a layer of white or yellowish mucus; the breath is often sour, and in some cases, aphæe appear upon the parieties of the mouth; there is constant diarrhoea, intense thirst, and great emaciation. The diarrhoea after a time frequently diminishes, or ceases entirely, but soon returns with increased violence, the discharge being a thin, serous fluid, of a yellowish or greenish color, and exhaling a strong, acid smell. The face and extremities become cold; the pulse small and irregular; the respiration quick and short. The counte-

nance becomes shrunken and pale. The child utters continually a low piteous moan, or lies upon its back, with the eyes fixed and glassy, and half closed. No pain or tenderness is indicated upon gentle pressure of the abdomen; the latter, however, is often greatly swollen and tympanitic. The child becomes more and more exhausted, and finally expires quietly and without convulsions. This appears to constitute that form of disease which is described by Camerer, Pommer, Hergt, Romberg, Droste and others, as *gastro-malacia*."

Causes.—One cannot read the above and other descriptions of this much discussed form of disease without seeing in it severe and long-lasting acid poisoning. *Gastro-malacia* seems nothing more than severe indigestion with a resultant disorganization.

Diagnosis.—The disease most liable to be confounded with it is *cholera infantum*. Meissner thinks it is rarely an object of diagnosis, but is a post mortem phenomena.

Treatment.—The first thing to be done is to change the child's food so as to render it more digestible. It would be best to suspend for a short time all food, and give it warm water instead to dilute the gastric juice and wash it down into the bowels. If the bile is disorganized, the passages being green, a little soda may be added to the warm water. After the stomach has had a little rest, and its irritability controlled by remedies, the blandest, most infantile form of food may be given in gradually increasing quantities. (Consult Food).

Hartmann has pointed out a course of treatment for the symptoms styled *gastro-malacia*, with the indications, which is as follows:

"For the violent fever which characterizes this disease, but which will at first cause scarcely any physician to suspect the presence of this dangerous disorder, it is eminently proper to give a dose of *Aconite*, which should be as minute as possible in order to secure a prompt and thoroughly pervasive action of the drug. If there should be no improvement in the course of an hour, and gastric symptoms should commence to show themselves, and the abdomen should be distended and hot, painful to the touch, with violent thirst, cold feet and hands, we might suspect an incipient inflammation of the bowels, which would require *Bryonia*, or, if the pupils should be dilated, sopor and retching, with raising of phlegm, should be present, and there should be other symptoms denoting the approach of an encephalic fever, *Belladonna* 30th would deserve a preference. *Bryonia* and *Belladonna* seem to be particularly suitable, if the symptoms of *gastro-malacia* develop themselves shortly after weaning the child. With these remedies I have certainly succeeded in removing what seemed to be a most acute form of this disease.

"If the symptoms should indicate an acute attack of *gastro-malacia*, and *Aconite*, with which we should always commence the treatment.

(if there is fever), be without avail, *Arsenic* should be resorted to. It does more in this disease than *Veratrum* or *Tartar emeticus*. The dose may be repeated. For the sub-acute form of gastro-malacia, I recommend *Antimonium crudum* 6th; it responds strikingly to the symptoms characterizing this form of the disease, and, even if it should fail to remove them entirely, it will avert the pressing danger. Besides *Ipecucuanha*, *Pulsatilla* and *Nux vomica*, the remaining symptoms may require *Antimonium tartaricum* 6th, which is certainly indicated by the following condition: Frequent, sour vomiting, empty retching and straining to vomit, with ineffectual urging to diarrhoeic stool or with slimy diarrhoea, drowsiness with contracted pupils, quiet breathing, and very bad humor, the child cannot be touched without causing it to cry. The drowsiness and the contraction of the pupils are characteristic indications of the *Tartar emetic*, whereas a condition bordering on sopor speaks more in favor of *Belladonna*. If the intestinal canal should seem to be more affected than the stomach; if the diarrhoea should be more prominent than the urging to vomit, and the passages should have a sour smell and be of the color of clay; the appetite gone, with great restlessness and nervousness, debility, emaciation; in such a case *Calcarea* may be exhibited, especially if the child should be teething, for there is no better remedy for the disorders incidental to dentition than *Calcarea*. Either the *Culcarea acetica* or *carbonica* may be used indiscriminately, nor is it necessary to employ the highest attenuations. *Acidum phosphoricum* probably deserves a preference when the diarrhoea, though of long standing, has not weakened the child; the passages take place every fifteen minutes, and the discharges are slimy, of a whitish-gray color. This acid is more suitable in the first stages of the disease, or for the after-diseases; it has none of the really characteristic symptoms of this affection. Some Homeopathic physicians recommend *Kreasotum* for gastro-malacia. It does not seem to me that its pathogenesis points at all to this disease as being contained within the curative sphere of this drug; nevertheless my confidence in the credibility of the advocates of *Kreasote* in this disease is such that I should not hesitate to try this drug if another case of gastro-malacia should occur in my practice."

Jahr records his experience in favor of *Kreasote* as follows, " Before I became acquainted with the splendid virtues of *Kreasotum*, I had already lost three children whom I had treated with *Calcarea* and *Arsenicum*. Since I have used *Kreasotum* I have not met with a single loss. I give the remedy in a watery solution, three globules of the 30th, a teaspoonful every three or four hours. Hempel says *Secale* is also a valuable remedy."

Consult also Vomiting, Indigestion, Gastritis, Cholera Infantum.

DISEASES OF THE INTESTINAL CANAL.

DEVELOPMENT OF THE INTESTINES.

The first rudiments of the intestinal tube in the human embryo, have not as yet been observed with sufficient exactness to allow of the history of its evolution to be correctly given. It is rather by analogy and induction, than by direct observation, that any data upon the form of rudiments of the intestines can be established. Yet the works of those celebrated anatomists, Gray, Klien, Stricker, Frey, Meckel, Oken, Wolf, and Tiedmann, have conducted us to results, which, if they are not incontestably true, are, at least, very probable, (See p. 45).

Thus it appears to be proved that the intestinal tube, at first consists of nothing more than an oblong vesicle, which, elongating at the same time both superiorly and inferiorly, forms at both ends an imperforate canal; but which soon opens both at the mouth and anus. Other anatomists have asserted that the intestinal canal was formed in the lateral parts, which, by the law of conjugation established by Serres in organology, advanced, as it were, toward each other, and uniting anteriorly in this manner, completed the hollow cylinder of the intestines. Rolando supposed that the intestinal canal was formed in separate portions, and afterward united.

The primitive situation of the intestinal tube has also given rise to numerous conjectures. Some suppose it primitively situated against the vertebral column, others at the anterior part of the abdomen at the base of the umbilical cord, and communicating directly with the umbilical vesical. Velpeau says that it is enclosed in one of the swellings of the cord, where it is found surrounded by a serous fluid, in the middle of which is seen a small quantity of yellow matter. Wolf and Meckel says that it is only situated near the umbilicus when it has undergone a sort of bending forward, and being thus curved, it forms an angle more or less acute, which goes to the base of the cord in passing through the umbilical opening.

We have seen (p. 45) that the middle portion of the primitive intestine is at first a groove communicating freely with the umbilical ves-

cle. This groove, according to recent observations (Gray, p. 121), is early converted into a strait tube which, however, is still open when it communicates with the umbilical vesicle. This opening contracts more and more as the embryo advances in development, until at length all traces of the vitelline duct and yolk-sac diminish. Abnormally, a diverticulum is sometimes formed, from the small intestine near the cæcum, which is regarded with great probability as a previous portion of the omphalus mesenteric duct, and which has been found to pass into the umbilical cord, (see p. 26). The peritoneal folds are furnished by the splanchno-pleural layer of the mesoblast, coated by the epithelial layer of hypoblast.

Whatever be the mode by which the intestinal apparatus assumes the form of a tube, it is found, at the third or fourth month, perfectly convulated, terminating above in the stomach, and below at the anus. The cavity is, at this time, very narrow, and the younger the foetus, the shorter is the intestinal tube. From the sixth to the eighth month, the proportions of the intestinal tube are nearly analogous to those of its different constitutional parts in adults; thus, at this period, the convolutions of the small intestines are very numerous; and the sacculi of the large intestines are formed about the fifth month, according to observations of Morgagni. The proportion at this time, between the small and large intestines, is as eight to six. These observations have been made by Haller, Scemmering, Wrisberg, Meckel and others of more recent date.

Meckel has also remarked, that towards the commencement of the third month several longitudinal folds appear, and that about the end of the fourth month the villi are seen under the form of a number of elevations. About the seventh month the valvulae conniventes form; from this period until the ninth month, the abdominal circulation is very active, and a number of vascular ramifications are observed to appear, first on the mucous membrane, and afterwards on the exterior surface of the intestines. From this habitual hyperæmia of the digestive tube, there results a rose color of the internal coat; which, in consequence of the engorgements of its vessels, is easily detached from the serous membrane. In very young infants the muscular fibres are but slightly developed, so that the peritoneal membrane and the mucous membrane are in close approximation. The cæcum begins to appear from the sixth to the ninth week. It assumes, by degrees, its form and relative proportions. Lastly, the great omentum which before the second month had not appeared, at last begins to

show itself on the loose edges of the stomach, and at the period of birth acquires some size; but during the whole of the intra-uterine life remains extremely thin, and it is not until after birth, that it becomes thickened by the development of the adipose tissue, which increases in growth more or less, according to the natural tendency of the individual. The glandular or lymphatic apparatus, which forms an appendage to the digestive tube, will be considered in another place.

While the intestinal tube undergoes these changes, and the different portions constituting it form a union by which the canal is to be completed, and in which the organs, together with the internal membrane itself, were pouring their secretions for lubrication and perhaps for nourishment, a series of phenomena constituting a species of intra-uterine digestion, has commenced, the duration of which is about two-thirds of the foetal life, and which terminates at birth. This digestion of matters spread or secreted throughout the digestive passages, bears some resemblance, in reference to its duration, to that of hibernating animals.

If this be so, the intestinal tube of a young infant just born, will, on examination, exhibit all the anatomical phenomena which the digestive apparatus of an adult presents who had died during digestion. This is, in truth, what the digestive organs of new-born children exhibit. Let us stop then, for a moment, to consider—1. The form and aspect of the organs of digestion in a new-born infant. 2. The nature and physical qualities of the matters contained in the digestive tube. 3. The manner in which the first alvine evacuations are made, and the phenomena which attend it. All this is of importance to know; for to appreciate properly the various pathological conditions of the intestinal tube of young infants, it is absolutely necessary to be familiar with the true characters of this organ in a state of health.

1. The duodenum is a twelve inch loop of intestine extending from the stomach downward and backward under the liver, then abruptly bending upward almost to the pylorus where the common bile and pancreatic duct enters, and the jejunum commences. Its internal surface has a rosy appearance, which is continued to the jejunum, but is less remarkable in the ileum. The jejunum has some traces of the valvulae conniventes; the villi are equally developed, and very often in the jejunum are found some separate mucous follicles, about the size of the head of a pin, and almost always white; some follicular plexus, slightly projecting, also white, and often with a little black

point on the top, as observed in adults, are met with in the ileum. The ileo-cæcal valve is a little projecting, and the opening which it surrounds, extremely small. In most children it would be difficult to pass even a crow-quill; at this age it prevents the regurgitation of substances, and even gas, from the great intestines to the small, but allows a free passage for the contents of the small intestines into the large. This can easily be proved by passing a current of water through one or the other of the extremities of the digestive tube; in the one direction water passes freely, while in the other it will meet with an insurmountable obstacle. Neither do the cæcum nor colon as yet present their depressions and prominences in as distinct a manner as afterwards, or as they appear in adults.

After birth the internal membrane of the digestive passages gradually loses its habitual color, and becomes of a milky white, and continues for some time flocculent. During the whole of the first year it is remarkable for this appearance, and for the abundant secretion of mucus.

2. The matters contained in the intestinal canal of a young infant vary with reference to their color and consistence. Generally there is found in the duodenum and jejunum, thick mucous substances of a white color, adhering to the walls of the intestines, sometimes collected together in certain parts, and sometimes spread over them. They are often colored yellow, owing to the bile; and there are also found balls or small masses of a green color, which is observed in the intestines a long time after the expulsion of the meconium. Billard found them in a child eight or ten days old; it would appear that they did not possess any irritating property; for their contact never produces inflammation of the mucous membrane. It is very common also to find about the ileo-cæcal region, an accumulation of yellow and frothy liquid; the large intestines are always filled with meconium, of the consistence of pitch, and of a dark green color—a circumstance noted by all authors.

3. Such are, in the ordinary state, the varieties of aspect presented by the matters contained in the intestines. The meconium—that is to say, the thick, pitchy, green substance, which may be regarded as the result of foetal digestion, and which may also be compared to the faeces in the colon of an adult—does not generally assume the physical characters which have been assigned to it, until it has arrived at the large intestines, where decomposition commences; and when it is found at the commencement of the small intestines, and even in the

stomach, it is because it has ascended thither by a true antiperistaltic movement.

Yet there have been very singular aberrations observed with respect to this general rule. Such, for example, is the extraordinary case of meconium filling the imperforate œsophagus of an acephalous child, the account of which has been given by M. Lallemand. As we are not led to believe, after this curious fact, that the meconium formed by the waters of the amnion which had been swallowed, and by the mucus secreted on the surface of the intestines, acquired physical properties in consequence of its prolonged contact with the digestive tube? And if it be met with in the colon, is it not because this portion of the intestines receives generally the first of the intestinal matters, and which are found abounding in this part in proportion as they are introduced, or have been secreted in the intestines? This view of the subject accords with the opinion of physiologists, who think that the nutrition of the fœtus is carried on not only by means of the placenary circulation, but also by the liquor amnii. (Lobstein, *Essai sur la nutrition du fœtus*. Strasburg, 1802). But let us return to the subject, and to the description of the varieties of aspect, which the healthy state of the mucous membrane of a young child presents.

When all the liquid parts of the intestinal tube are removed, there still remains a layer of thick mucus adhering to the internal surface of the canal. This layer may be raised with the nail, under the form of a pellicle, resembling, to a superficial observer, portions of the mucous membrane itself. It is probable this layer of mucous is what certain practitioners regard as vitiated matters, or saburra, for the expulsion of which they have recommended purgatives from the time of birth.

But whether this mucus be for no other object than protection of the mucous membrane when exposed to the contact of unaccustomed aliments, or whether it be a simple exudation of a fluid contained for a long time in the alimentary canal, attaching itself, without any use, to its surface—it never remains there but for a short time, and detaches itself, without the assistance of any purgative, by a kind of natural exfoliation.

This exfoliation occurs in very thin lamellæ, which, being rolled together, form the small, white flocculi so frequently met with in the stools of young children; and where the surface of the duodenum or jejunum is colored with bile, it is this layer of mucus that is colored, so that, in removing it, the color also disappears from the intestine.

It is well known that the meconium always colors the mucous membrane green, with which it is in contact. But it often happens, when it is evacuated, that it carries with it some pellicular fragments of the mucous coating by which species of exfoliation the colon loses its green color. If the meconium be very liquid, it is quickly expelled leaving after it the green coloring; but it sometimes passes off by little at a time, and then the colon presents, alternately, irregular patches of green and white. This can easily be ascertained by raising the meconium gently from the surface of the colon with the back of a scalpel. The membranous pulp, and the fragments of mucus, together with other intestinal matters, will be seen to be raised at the same time, leaving the internal membrane colorless.

As soon as the child has commenced a new kind of alimentation, the contents of the intestines change their appearance, the phenomena of digestion becoming, with respect to the manner in which it is performed, analogous to what it will be during the remainder of life. A great deal of importance is usually attached to the first discharge from the bowels; and nurses are eager to administer to a child just born, some mild purgative, under the fear of retaining, for too long a time, a substance which absurd prejudices have induced them to regard as irritating, and as capable of exercising a serious effect on the system.

Malformations.—We have already enumerated on page 65, the various malformations which have occurred in this portion of the child.

SIMPLE DIARRHœA.

In considering the diseases of the intestines we meet two different morbid conditions, one in which there is no evident anatomical lesion to explain the symptoms, and which appears to depend on simple functional derangement, to be designated by the title of simple diarrhoea; and another in which there is evident inflammation with its results, to be described under the titles of entero-colitis. Dewees, Eberle, and other excellent writers treat of the diseases of the intestines under two heads only, those of diarrhoea and cholera infantum. Stewart and Condie treat of the same diseases, but describe inflammation of the intestines also, by the titles of enteritis and colitis. Most of these writers make different forms of diarrhoea, the feculent, biliary, mucous, chylous and lienteric. They ought not to be regarded as constituting separate and essential morbid conditions of the intestinal tube, but merely degrees or stages of simple diarrhoea or functional derangement, and entero-colitis or inflamma-

tion of the intestines. We may in fact have faecal, biliary, mucous, or lienteric discharges at different stages of both these diseased conditions.

Under this title, simple diarrhoea, we shall describe a form of disease to which children are very subject in which the pathological condition appears to be one of mere functional disorder, or of very moderate hyperæmia or catarrh of the intestinal mucous membrane. It might be assumed with some that the disorder is at all times one of mild catarrh of the bowels, but it is best, in a practical point of view, to consider it as being sometimes one of functional disturbance only, since many observers of high authority declare that they meet with even fatal diarrhoea in which no anatomical alterations are found after death.

Frequency.—It is undoubtedly a very frequent ailment in children, more especially from birth to the termination of the first dentition. It is of common, though of less frequent occurrence from the last mentioned period to the age of eight or ten years, after which, according to my experience, it becomes rare.

The decided development of the circular fibres in the small intestines, and the excitable conditions of the alimentary canal in infants render them particularly liable to the occurrence of diarrhoea from slight cause, it is consequently an affection of far more frequent occurrence during the early period of life than at any subsequent period. It may last only a few hours, and then cease spontaneously, or the evacuations may occur every few minutes, and continue with little or no abatement for a considerable length of time, exhausting the strength of the patient, and producing extreme emaciation. (Condie).

Causes.—The causes of the disease during infancy are *unfavorable hygienic conditions*, as the habitation of unwholesome, ill-ventilated, damp, and filthy dwellings, or of contracted and crowded quarters of cities and towns; an *unhealthy state of the milk* of the nurse; the use of *artificial diet* at too early an age, especially when badly chosen; *cold*; *dentition*; and lastly, great *atmospheric heats*. The most important of these are improper alimentation, and particularly one consisting chiefly of farinaceous substances to the exclusion of a proper amount of milk, and dentition.

The chief cause of the disease after the first dentition are: the habitual use of *improper food*; the *loss* of digestive power, which often follows a severe indigestion, or an attack of some acute disease; the

debility of constitution which attends sudden and rapid growth; the want of proper exercise and exposure to the air; the predisposition which exists in some children from *hereditary causes*; and the disturbing influence of the *second dentition*.

The system of indiscriminate diet allowed to children in this country is, it seems to me, a fruitful cause of gastric and intestinal complaints. As a general rule, children over two or three years of age are allowed amongst us to eat of the food prepared for the older members of the family. Now, any one who will reflect upon the variety of dishes habitually placed upon an American table, ought not to be surprised to see children permitted a choice amidst such profusion, pale, thin, delicate, exposed to frequent indigestions, attacks of diarrhoea and entero-colitis, to gastric fevers, and the host of minor ills attendant upon feeble digestive powers.

One of the most common causes of this disease is the presence of acrid matters of the food still imperfectly digested, or from irritating substances introduced into the intestines. In one sense it may be considered as the effect of indigestion, and therefore might be regarded as a symptom of that disease; but the food may be in reality digested, although there may be acid or other irritating matters contained in the mass of the contents of the bowels. Cold or wet applied to the surface of the body, or a sudden transition from a heated to a chilly atmosphere, acts by constringing the skin, and thus directing the course of the blood to the internal surfaces, will also produce a common diarrhoea in children, and may be very troublesome.

The quality of the mother's milk may be of such a character that a permanent cure can not be affected without weaning the infant.

Symptoms.—In infants the appearance of the diarrhoea is usually preceded or accompanied by slight disturbance of the *temper* and *comfort* of the child. There is some degree of *restlessness*, *peevishness*, and disposition to cry; the child sleeps less than usual, and often starts and moans during sleep; all of which symptoms are more marked, as is the case indeed in nearly all the ailments of children, during the night. Though the symptoms described are observed from time to time, and particularly during the night, they are not always present, as the infant will occasionally through the day seem perfectly well and comfortable, with the exception perhaps of slight paleness and languor, almost always perceptible upon its countenance. There is no *fever* in these cases, or at least nothing more than unusual warmth of

the hands, feet, and abdomen, at night. If a marked febrile reaction take place, there would be reason to suspect the existence of some degree of entero-colitis. The *mouth* often becomes, after a few days, a little warmer and less moist than usual; the *tongue* is generally moist and only slightly coated, and the *appetite* is commonly diminished, as shown by the child's nursing with less eagerness, and at longer intervals than before. Usually there is a loss or irregularity of appetite, and often with more or less nausea and vomiting; in many instances however, the stomach is not in the least affected, and the appetite remains unimpaired. Increased thirst commonly attends, and some degree of griping generally precedes and follows each discharge from the bowels. Although there is seldom much tensemus, yet a slight degree attends upon simple diarrhoea in children, much more frequently than in the adult.

In very mild cases the *stools* are at first, and sometimes throughout the attack, feculent; the only differences from their ordinary characters which occur, being that they are more frequent, thinner, more copious than usual, and that the odor is changed so as to become acrid and offensive. In severe cases, the stools contain less feculent matter, becomes yet more fluid and sometimes watery, and exhibits small particles of a greenish color, scattered throughout them; or the whole of the discharge is of a bright green color, and is intermixed with portions of mucus. In many of the cases, whitish lumps, evidently consisting of undigested curd, are observed mixed with the other substances upon the napkin. The number of stools varies from two, three or four, to six or eight in twenty-four hours. The number last mentioned is seldom exceeded, so long as the diarrhoea remains simple. The *abdomen* is seldom distended, or painful to the touch. The *general appearance* of the child almost always shows the effects of the malady upon the constitution, after a few days. The countenance becomes paler and thinner; the eyes look somewhat hollow; the edges of the orbits are more defined, and often present a pale bluish circle; slight emaciation takes place, and the flesh of the child becomes softer and more relaxed than before the attack. While if the attack sets in severely, a day or two sometimes suffices to reduce the child to a state of extreme weakness and exhaustion, and in young infants, all the symptoms of spurious hydrocephalus sometimes makes its appearance.

Anatomical Lesions.--Being of purely functional disturbance, unattended by any of the ordinary signs of inflammatory action, some

very competent observers affirm that they have failed to find in a certain proportion of cases of diarrhoea any lesions appreciable to the senses. Breton states that fifty-seven cases of gastro-intestinal disease observed by himself, there were four in which not a trace of inflammation or any other appreciable lesion of the digestive tube could be found. Rilliet and Barthez assert that in about every twelve children affected with more or less abundant diarrhoea, and in whom we might expect to find colitis, there will be one in whom the gastro-intestinal tube will be found in a state of perfect integrity, the secretion only being vitiated. This conclusion was deduced from a comparison of nearly three hundred autopsies. One must suppose, therefore that the class of cases we have described as simple diarrhoea are sometimes quite independent of any anatomical change in the tissues, recognizable by ordinary methods of examination, or that those changes are so slight, or so evanescent as to disappear after death, or that they are only of the mildest forms of catarrhal inflammation. It is not likely it seems to us, that further and more minute investigation with the microscope, will reveal tissue changes which are not discoverable by the unassisted senses.

When the anatomical changes, constituting the catarrhal state, are found in children who presented during life the symptoms of simple diarrhoea, they will be such as are described by Niemeyer in the following passage. "Catarrh rarely affects the entire intestinal canal. It is most frequent in the large intestines, less so in the ileum, and rarest in the jejunum and duodenum. The anatomical changes left in the cadaver by acute catarrh, are sometimes pale, at others dark redness, swelling, relaxation, and friability of the mucous membrane, which is sometimes diffuse, at others limited to the vicinity of the solitary glands, and of Payers patches, and a serous infiltration of the submucous tissue. Occasionally after death the injection has entirely disappeared, and the mucous membrane appears pale and bloodless. Swelling of the solitary glands, and glands of Peyer is an almost constant appearance; they distinctly project above the surface of the mucous membrane. The mesenteric glands also are usually found hyperæmic, and somewhat enlarged. The contents of the intestines consist of plentiful serous fluid, mixed with detached epithelial and young cells, subsequently of a cloudy mucus which is adherent to the wall of the intestine, and contains epithelial structure." For a fuller exposition of this subject the reader is referred to Woodward on *Camp Diseases* where the opportunities for post mortem examination of this

disease, although occurring but seldom and in adults, yet showed little beyond a congestion of the intestinal vessels of variable intensity.

Diarrhea may be classified according to the character of the discharges, as follows :

Feculent Diarrhoea, in which the discharges are increased in quantity and frequency, but preserve their natural character, the evacuations being preceded by slight nausea and accompanied by some pain.

Bilious Diarrhoea.—In this species the feces are loose, copious and of a bright yellow or green, changing to various shades of green and black, and the bowels are stimulated to an inordinate action by an overcharge of bile, either vitiated or not. Sometimes the urine is tinged yellow.

Mucous Diarrhoea.—The evacuations in this variety contain a variable amount of mucus, or may perhaps consist almost entirely of it. The discharge may not be very frequent nor very large; there is generally some little tenesmus, and occasionally a little blood. Ordinarily their color is greenish or light green, and very offensive. Sometimes these green stools are originally yellow, but become quite green in an hour or two. The mucus is at first thin and transparent; afterward it becomes thicker, opaque, and almost puriform. This form appears to arise from sudden transitions of the weather, or from a sudden chill.

Chylous Diarrhoea.—In this form the discharges are whitish or milky. There appears to be rather a deficient secretion of bile, than any obstruction to its escape as it is never attended by jaundice. This form is often present in cases of *tabes mesenterica*.

Lienteric Diarrhoea.—This is characterized by the transit of the food nearly unchanged through the alimentary canal. It sometimes follows some of the other species but more frequently dysentery. The child is uneasy after eating, and soon has a desire to go to stool, where it passes the food taken shortly before. According to Dewees, it generally commences during the chronic state of diarrhoea, by showing perhaps, that some one article of diet only has passed the bowels unchanged, as potatoes, apples, or other vegetable substances, or fruit which has been incautiously given to the child. This is soon followed by other articles, as meat, etc., and finally everything almost that enters the stomach is speedily conveyed through the intestines, with little or no appearance of having been acted upon by the powers of the stomach. The appetite is sometimes voracious in this disease, and the thirst is considerable. The complaint is seated altogether in the stomach itself, and owes its existence to the too great irritability

of his organ ; for no sooner is food lodged in it, than it makes efforts by an increased peristaltic action to discharge it, and the intestines transmit it with equal speed to their extremity, there to be discharged.

The *duration* of the disorder is generally short, as it seldom lasts more than three or four days, or a week. It may terminate in complete restoration to health without its having exposed the life of the child to danger, or, if the causes which gave rise to it continue in action, if the child is of a delicate constitution, or the treatment not correct, and especially if of too perturbing a character, it is very apt to run into entero-colitis, and expose the patient to all the dangers of that disease.

In older children (after the first dentition), the disease is much less frequent than in infants, and presents a different train of symptoms. Often it is nothing more than slight disorder of the bowels, amounting to three, four or five stools, thinner and more abundant than usual, accompanied by slight colicky pains, and unattended by fever or other signs of sickness, which, after continuing for one, two, or three days, ceases, and the child regains its usual health. Some children are particularly liable to these attacks, and suffer from them every few weeks, or after any indiscretion in diet ; whilst in others they are rare, let the diet be what it may.

There is another form of simple diarrhoea that occurs in children from two and a half to seven and eight years of age, lasts a considerably longer time, and is much less under the control of remedial measures. This form of the disease is rarely accompanied by fever, or by any constitutional symptoms rendering it necessary to confine the child either to the bed or house. The only symptoms beside the diarrhoea have been some degree of paleness, and moderate emaciation ; slight weakness, shown by an indisposition on the part of the child to play with its usual spirit, by an inclination to lie about from time to time through the day on the sofa or floor, and by complaints of "being tired ;" irritability of temper and peevishness ; irregular appetite ; picking of the nose ; and restless, disturbed sleep at night, attended with moaning, crying, starting, and grinding of the teeth ; all of which symptoms generally convince the mother that the child is suffering from worms. The abdomen is sometimes slightly tumid, but remains natural as to tension, and is not painful on pressure. There is no pain except slight colics in some cases. The stools have generally numbered from three to five, and in a few cases as many as six or eight a day. They are semi-fluid in consistence, often of a very

offensive odor, and consist usually of feculent matter, which is sometimes clay-colored, more frequently dark-brown, and, in other instances, deep yellow or orange in color. They are often also of a frothy character. The diarrhoea is evidently greatly influenced by the diet, showing, an intimate dependence of the malady upon the condition of the stomach, which seemed to have lost in greater or less degree its digestive power. This form is rarely due to enervation of the sympathetic nervous system.

The *course* of the disease in this form is variable. In some it will last a few weeks, and then, under the influence of diet and remedies, cease, to recur and run the same course after a short period. In others it will last a much longer time in spite of all treatment.

Diagnosis.—The diagnosis of simple diarrhoea will rarely present any difficulties, since there is nothing with which it could be confounded, except the diarrhoea from tubercular ulceration of the bowels, or entero-colitis. From the former it is to be distinguished by the history of the case, and by the signs of tuberculization in other parts of the economy; from the latter, by the absence of signs of inflammatory action.

Prognosis.—The prognosis is favorable so long as the disease remains simple. The physician should never forget, however, the disposition which is inherent in it to pass into inflammation, nor to fail to make the possible occurrence of this transition one element in his prognosis. During infancy it is always more serious than after that period, from the feebler power of resistance on the part of the constitution to disease at that age, which undoubtedly allows this simple affection to prove fatal in some instances, probably from the shock to the nervous system, and from the drain upon the serum of the blood. After infancy it is rarely a dangerous disorder, both because of the greater stamina existing at that age, and from the fact that the disposition of extension to disease is less strong.

Although the dangers attendant upon simple diarrhoea are not considerable, yet the affection is one which it is never wise to make light of. An infant may be reduced by it to a state of such extreme exhaustion as seriously to endanger life. Diarrhoea, indeed is the exciting cause of the greater number of cases of spurious hydrocephalus in which the cerebral disturbance from debility, simulates real inflammatory disease of the brain. In such circumstances, too, the diarrhoea has not infrequently ceased some time before the other more alarming symptoms made their appearance. The cessation of

disease may be due not so much to the quieting of irritation, as to the exhaustion of the nervous energy which is essential to the performance of their secretory function by the glands of the intestines, or to the due maintenance of the peristaltic movements of the bowels. In infants prematurely weaned, or improperly fed after being taken from the breast, we often see this fact exemplified in the cessation, some twelve or twenty-four hours before death, of the diarrhoea from which they have been suffering for weeks together. Nor must we ever make too sure that because purging has ceased, therefore danger is over; or venture to relax our watchful care until the continuance of amendment for twenty-four hours or more, shows that there is indeed no longer anything to fear.

Treatment. Hygienic Means.—As dietetic irregularities are the chief cause of this disease, proper feeding will claim our first attention. If the disease has existed for some time, or the child is much exhausted, the food selected must be as primitive as possible. Meigs and Pepper say that after the disease is established, the treatment must consist first in attention to the *diet, exercise, and state of the gums* of the child. In many cases, careful regulation of the diet and exercise, and lancing the gums when they are much distended and vascular from the pressure of the advancing teeth, will suffice to arrest the disorder in a few days, without the necessity of resorting to drugs, which ought certainly to be avoided whenever it is possible to do so.

If the child is at the breast, we must ascertain whether the milk of the nurse is good, by inquiry as to its appearance, by examination with the microscope, and by reference to her health, diet, temper, etc., all of which circumstances, we have seen, more or less affect the mammary secretion. If we conclude that the milk is good, or that it has been disturbed in its healthy properties only by a transient cause, the child should be continued at the breast, with the precaution, however, of not allowing it to nurse quite as much as usual. An infant suffering from any kind of diarrhoea, had better be restricted entirely to the breast, unless it be clear that the supply of milk is quite insufficient or of poor quality. If we determine that the milk is unhealthy, it must be changed, or the child weaned and fed; of course the former alternative is infinitely preferable if the child is under a year old, or even eighteen months, if it seems to have a rather delicate constitution. (See Foods).

If the case occurs in a child already weaned, or in one fed partly on artificial diet, the regulation of the kind, preparation, and quantity of

aliment is of the utmost consequence. It ought to consist chiefly of milk or cream weakened with water, unless it has been clearly shown by previous trial that these articles do not agree with the child. As a general principle, during the existence of diarrhoea, or at least the early stage of it, and before the strength has been reduced by the disorder, the proportions of cream or milk ought to be considerably less than in health. Not only this, but the total quantity of food in the day should be diminished, unless the ordinary amount seems to be really necessary for the sustentation of the strength. If it be found, however, after patient trial, that the child either will not take, or does not digest this kind of food, we may try arrow-root or rice water, thin gruel or panada, alternated with very carefully prepared chicken or mutton water. If the child is six or eight months old, it often suits well to allow it a piece of juicy beef or a chicken bone to suck, or from one to several teaspoonfuls of meat of chicken or mutton minced very fine.

For older children with a common attack of simple diarrhoea, the diet should consist for a few days of boiled milk with bread, of gruels made with boiled milk and arrow-root, rice-flour, sago, tapioca, or common wheat flour, and of small quantities of light broths. Meats are, for the time, improper, and all vegetables, with the exception of rice, yet worse.

In the case of infants it is best to recommend a continuation of the ordinary exercise, unless the weather be cold and damp. Indeed, in good weather, exposure to the air and proper isolation are more important during the existence of this disorder than even during health. The same remarks apply to older children, with the exception that they ought not to be allowed to fatigue themselves, particularly in warm weather, as this would have a tendency to aggravate the complaint.

When the disorder occurs in a teething child, the gums of the child ought always to be examined by the physician, and if found swelled, vascular, of a deeply red color, and hot, with the outline of the advanced tooth perceptible, they should be freely incised to the tooth. If, on the contrary, the tooth is too deep to be felt, Meigs advises only a slight and superficial scarification in order to relieve the tension of the gum, and yet to avoid coming in contact with the tooth, which is sometimes injured by the lancet, when touched before the deposit of enamel is fully completed. In such cases lancing is superfluous.

The chronic form of simple diarrhoea, occurring in children who

have completed the first dentition, has always proved difficult to manage. The disease depends in great part on a loss of the digestive power of the stomach and duodenum. The diet must depend on the peculiarity of the individual; what we should seek is such an one as will be easily digested by the patient, the materials of which shall not appear in the stools, and one which does not manifestly increase, if it fail to moderate the frequency of the discharge, usually the more infantile the diet the better. The one which Meigs found to succeed best, consisted of boiled milk with stale bread for breakfast and tea, and the tenderest meats, as very fine beef, mutton, chickens, or birds, with rice as the only vegetable, for dinner. If the child likes flour or rice pap, it may have either in place of the bread and milk. If it will take none of these, it may have milk, warm water and sugar, with bread; or very delicate mush and milk, or milk toast. Should it refuse the dinner recommended above, we may substitute delicate soup or some of the milk preparations. Between meals it ought to be allowed nothing but dry bread. All rich food, dessert, fruits, all vegetables except rice, candies and comfits, all kinds of cakes and hot bread, in fact, everything except the articles mentioned or similar ones, ought to be rigidly, systematically, and perseveringly forbidden. Until this has been done for many days, or for several weeks, the disease has always according to my experience, obstinately persisted. In some cases, inunction with sweet oil, will do more than all other forms of feeding and articles of diet.

Remedial Measures.—As we must individualize the diet, so the remedy for each case must be carefully selected. The remedies that have been most serviceable are *Arsenicum*, *Mercurius*, *Cina* and *Sulphur*.

For mucous diarrhoea from exposure, cold, irritating ingestae, etc., the French Homœopaths make much use of *Zingiber* 6, *Capsicum* 6, or *Bismuth* 12. Dr. Holcombe adds "*Ipecac*, *Mercurius dulc.*, *Turpentine*, *Copavia*, *Petroleum*, *Chamomilla*, *Pulsatilla*, *Dulcamara*, *Leptandra*." If very profuse from general debility, anaemia or deep rooted cachexias, *Sulphur*, *Calcarea carb.*, *China* or *Ferrum* for the constitutional conditions.

In bilious diarrhoea give *Mercurius*, (pre-eminently), *Podophyllum*, *Leptandra*, *Aloes*, *Chamomilla*, *Colocynth*, *Nitric* or *acid*. If actual disease of the liver be detected, *Bryonia*, *Digitalis*, *Arsenicum*, *Phosphorus*, or *Lachesis* as called for. If the bilious form is not eliminated the disease is one of entero-colitis.

For feculent diarrhoea Dr. Holcombe gives "*Arsenicum, Camphor, Zingiber, Capsicum, Iris versicolor, Apis, Gamboge or Jalapa.*"

For lienteria, consult *Arsenicum, Phosphoric acid*, and *Oleander*. Hartmann gives great credit to *Oleander*. This has thin yellow undigested stools, small and involuntary, and especially when emitting flatus which smells like rotten eggs. There is canine hunger, with thirst. Tongue coated white, nausea and vomiting of ingesta, then hunger again. Worse in the morning. Lacuzon's experience in the islands of the Indian Ocean led him empirically to give *Zingiber* 12, with great success. *Zingiber* has brown stools, worse in the morning from cold damp wind and impure water. There is also much flatulence, colic, eructations tasting of the food for hours, particularly bread or meat.

If the diarrhoea is sour, in fact the whole child smells sour, *Rheum Hepar, Magn. carb. or Robinia*; if green, *Chamomilla, Ipec., or Cuprum*; if there is also colic with red face, *Belladonna*; with pale face, *Chamomilla, Sulphur*. During hot weather, *Ipecac, Nux vomica, Bryonia* and *Carbo veg.* If due to cold weather, *Dulcamara* and *Antimonium crudum*. If the diarrhea is due to chronic weakness, *Arsenicum, Carbo veg.* would be thought of.

The following indications are gleaned largely from Guernsey, and should be carefully studied and diligently compared with each other and also with those for other bowel diseases.

Aconite.—In acute cases. The skin is hot and dry; child restless and much excited; stools watery and often, of a dark green color. After the fever has subsided, we have but to wait and the diarrhoea will also disappear without the use of another remedy.

Aesthusa.—See the indications under Dentition, Indigestion, and Enterocolitis

Antimonium crud..—White coated tongue, some nausea and watery evacuations; sometimes hard lumps of faeces with water. Absence of thirst.

Argentum nit..—Stools green, fetid, mucous or watery, passing with much loud flatus. Much eructations. Child likes sweet food, which aggravates.

Arsenicum.—A prominent remedy. Much exhaustion and rapid emaciation; stools undigested; very offensive and painful stools immediately after taking nourishment. Stool and vomiting at the same time.

Belladonna.—The child is very drowsy, half sleeping and half waking; much moaning; starting during sleep; worries much especially in the afternoon; in teething children.

Bryonia.—Drinks large quantities of water. Diarrhoea from hot weather, or it is aggravated by the return of every hot spell of weather. Worse on motion.

Calcarea ostrea.—Chronic cases. In children who have large heads and open fontanelles. The head perspires much, so as to wet the pillow far around. Muscles soft and flabby. The child awakes at 3 A. M. See Dentition.

Carbo veg..—If *Bryonia* does not cure when indicated.

Chamomilla.—Stools watery or greenish, or like eggs beaten up. The child must be carried; it is very feverish and cross. The stool has the odor of rotten eggs.

China.—Chronic cases. Pale anaemic. Painless and undigested, putrid stools; very copious stools; worse every other day. Tip of tongue red. Compare *Arsenicum*.

Colocynth.—The passages are small and frequent, with very much pain, causing the child to writhe and twist as if in great distress, and to draw itself double.

Croton tig..—Colic and diarrhoea immediately after nursing. The stool escapes suddenly, as if with an expulsive spasm. Much flatus.

Dulcamara.—Every cool change of the weather excites diarrhoea; it is excited also by exposure in cold, damp places. Compare *Antimonium* and *Mercurius*.

Ferrum.—Undigested stools, with easy vomiting of ingesta, often with a very red face. Compare *Belladonna*.

Graphites.—Very frequent and small stools, with eruptions on the skin, from which oozes a gelatinous fluid. The stools is very often sour, and excoriates the external anus. Compare *Sulphur*.

Hepar.—Fœtid stools, the child itself smelling sour.

Ipecacuanha.—Much nausea or vomiting; almost constant nausea. Fermented stools, particularly indicated at the period of weaning, when food disagrees.

Iris.—Brown and very offensive diarrhoea, with cutting, colicky pains, nausea and vomiting; emission of very fœtid flatus.

Lachesis.—Excessively offensive stools; the child always awakens in distress. Chronic or severe cases.

Magnesia c.—Stools resembling the scum of a frog-pond. Stools green and slimy, or watery and sour.

Mercurius sol.—Much pain before stool; great relief immediately after. Stools frothy, slimy, bloody or dark green, with much straining. The child's thighs and legs are cold and clammy, particularly at night. Tongue large, pale, and flabby.

Nux v.—Alternate constipation and diarrhoea. Indigestible food has been the cause of the diarrhoea ; the passages are small and *frequent* and painful; much fretfulness. Worse at 4 A. M. Constipated in the morning and diarrhoea in the afternoon.

Opium.—Diarrhoea from fright or aggravated by fright. Last stage in protracted diarrhoea.

Phosphoric acid.—The diarrhoea does not seem to debilitate much, although of long continuance, and the mother wonders that the child remains so strong with it all. Profuse thin, painless stools.

Podophyllum p.—Morning diarrhoea, green or watery, or the stools may be quite natural, only too frequent. Prolapsus ani and diarrhoea. Cases occurring in the early summer.

Pulsatilla.—The stools are very changeable, no two alike; much worse at night.

Robinia.—Sour eructations; sour stools of infants; the whole child smells sour.

Rheum.—Very sour smelling stools, attended with much pain. Very sour smell of the child, which cannot be removed by any amount of washing and care in keeping it clean.

Rhus is beneficial in intestinal catarrh for the following symptoms : tearing pains down the legs—at every stool the pain streaks down the legs, which are powerless; stools are preceded by pain in the bowels; greenish stools, containing jelly-like globules or flakes, tenesmus with nausea and tearing pains in the intestines; aggravation from keeping quiet; worse particularly after twelve at night; very restless after that hour; perfect remission of the pain and of the urging after stool.

Sepia.—There is almost constant oozing from the bowels. (See *Argentum* and *Nux*).

Sulphur.—Particularly in children of delicate parents. Much redness around the anus, or excoriation between the thighs and upon the parts adjacent. Eruption of pimples upon the skin, or if the child, after getting better under other remedies, always gets worse again.

Veratrum alb.—Much exhaustion after every passage, with cold sweat upon the forehead and upon the skin in general.

Compare Dentition, Foods, Indigestion, etc.

COLIC, ENTERALGIA, FLATULENCE, ENTERIC SPASMS.

Colic, although not a disease, is often the only symptom, and distressing and persistent enough to merit our attention. It is generally the first phase of indigestion, and often so slight as to only occasion rolling of the eyes during sleep. Intense pain of the bowels is of frequent occurrence during infancy, and often occurs under circumstances where we have no reason to suspect, as its cause, any disturbance of the digestive function from the bad quality, or undue

quantity of the food. It has been known to have occurred daily, during the first month or two, and nearly at the same time of the day, generally towards the latter part of the afternoon, or, occurring at a regular period in the morning or forenoon. In most cases this species of colic is attended with the formation of gas within the intestines, and occasionally the tumid and tympanitic state of the abdomen is very great. In other cases, however, little or no flatulence is perceptible, the paroxysms of pain occurring at irregular intervals, and being readily induced by the feet becoming cold or wet. In slight attacks of colic the infant becomes very fretful, draws up its knees toward the abdomen, cries for a few minutes and then resumes its unusual quiet state as though nothing had occurred. These attacks may be repeated at longer or shorter intervals, and seldom cease permanently, or for any length of time until gas is discharged by the mouth or per anus, or an evacuation of feces, often thin and frothy takes place. In more violent attacks the infant commences suddenly to utter sharp, piercing screams which are often long continued or only interrupted by a few moments of quiet; the knees are forcibly drawn up or the legs are drawn up and extended in rapid succession. The expression of the countenance indicates severe suffering; the face being occasionally flushed or covered with large drops of perspiration. The abdomen is often distended, tense and tympanitic, or presents an irregular or knotted surface. No pain is induced by pressure upon any part of the abdomen, gentle pressure and frictions appear, indeed in most cases to afford decided relief. Notwithstanding the severity of the paroxysms in this form of infantile colic, the child immediately upon their cessation becomes quite cheerful and playful, and exhibits nothing in its appearance to indicate the severity of its recent sufferings. Its appetite is seldom impaired, the digestive and nutritive functions are in no degree distended or interrupted, and the general health seems often actually to improve, as Dr. Dewees very correctly remarks, the fattest and healthiest children are often those affected with it. (Condie).

As causes, we find the intestines are often indebted to their own secretions, for it often precedes or follows a diarrhoea. A relaxation of the gastric and intestinal muscular coats allow an intense degree of meteorism, without which the gases originate would be quickly propelled toward the anus and expelled. Taking cold, or having cold or wet feet are also productive of this affection. Mental emotions in the nurse, excessive crying, or constipation in the mother is almost sure

to give rise to colic and green stools in the child, so Dr. Woodhull observed in the Chicago Foundlings' Home. Remedies taken by the mother may occasion colic in the infant. Another cause may be intussusception.

Treatment.—For the immediate relief of a child with colic, the author has found a little sweetened hot water an excellent remedy. It supercedes all the "teas" that will be dosed the child, unless we provide some such ready means of relief. Whatever the remedy that may be indicated and that is prescribed should never be given in cold water. If given in water the spoon should be warmed so as to warm the medicine. Pillets or powders may be given in warm water. The cause must be removed and the consequences cured by general treatment. A child troubled with colic should never be laid upon its back or left side, but upon its right side or on its stomach—over a pillow. Otherwise the distended bowels will so crowd upon the cava and aorta as to partially arrest the circulation, and give rise to symptoms of strangulation, threatened convulsions and excessive fright, so often noticed in severe cases of colic. Sitting the child up and using gentle friction over stomach or back usually facilitate the expulsion of the offending gas.

The two remedies that have given the best satisfaction have been either *Chamomilla* or *Belladonna*.

Hartmann says: "It is well known that *Chamomilla* is an admirable remedy for flatulent complaints of children. All nurses and aunts knowing this, imagine that on this account, chamomile-tea and chamomile fomentations may be given, the more the better, not imagining that the excessive use of this drug can do harm. If the excessive use of *Chamomile* should have caused the disorder, one or two very small spoonfuls of *Coffee* without milk, sweetened with sugar, will afford the necessary relief, especially if the violent pains should be of a maddening nature and be attended with fever. Or in the absence of *Coffee*, the physician may resort to a few globules of *Coffea* 3d, which will sometimes act better than *Coffee*. If the pains and the excessive use of *Chamomile*, should have led to spasms and convulsions, one or two globules of *Ignatia* 12th, every half hour, may be exhibited. If the colic should be accompanied by nausea, vomiting and diarrhoea, *Pulsatilla* 12th, deserves a preference over the above-mentioned remedies, whereas *Nux vomica* 30th, should be substituted for the *Pulsatilla*, in case the bowels should be bound.

"If the mother should have experienced a violent emotion, she ought to wait some time before putting the child to the breast, and even then some milk should first be drawn with a breast-pump. This rule is frequently neglected, and indeed cannot be followed if the mother should be constantly exposed to the effects of grief and care.

In such cases it will happen that among a train of other symptoms, the above mentioned symptoms of gastric derangement make their appearance in the infant, and sometimes rise to a dangerous height. If a sudden fit of anger or chagrin in the mother should have induced the disturbance in the child, and flatulence, diarrhoea, shortness of breath, or even suffocative phenomena and convulsions should develop themselves, attended perhaps with fever, redness, bloating of the face; a single dose of *Chamomilla* 12th, will sometimes effect a complete restoration of the child's health. If the mother should already have drugged herself with chamomile-tea to neutralize the consequences of her excitement, and the gastric derangement of the infant should be accompanied by great nervousness, *Coffea* 6th should be exhibited. Besides these two remedies we may have to consider *Bryonia*, *Ignatia*, *Colocynth* and *Staphysagria*. A sudden joy or a sudden fright of the mother may likewise be the cause of some serious gastric disorder in the infant, the symptoms of which may seem to indicate *Chamomilla*. But this is not the remedy for such a condition, but a small dose of *Aconite* will remove the trouble quite speedily. It may be necessary to repeat this medicine, or if the nervous system should be very much excited, to follow it up with a dose of *Coffea* 6th. Instead of *Coffea*, *Opium* 6th will be found more suitable, especially if involuntary stools, and a soporous condition with difficulty of breathing should accompany the dyspeptic phenomena. Grief and sadness on the part of the nursing mother will inevitably injure the child's digestive system. *Ignatia* 12th is a specific remedy for the consequences of this silent grief, provided always that it ceases to exist. Even vomiting, convulsions, and epileptic paroxysms will yield to *Ignatia*, when occasioned by this cause. If *Ignatia* should not be sufficient to remove the disturbance, *Acidum phosphoricum* 12th may be exhibited, especially when a slow fever has supervened. *Colocynthis* 30th is another remedy for this affection, which will, however, be required but in very few cases, as the foregoing medicines are generally sufficient.

" If the flatulent condition should have resulted from a cold, *Chamomilla* will be found an excellent remedy for such symptoms as have been described in the foregoing paragraphs. Sometimes one dose will be sufficient, in other cases the medicine may have to be repeated every two or three hours. If the gastric symptoms be accompanied by painless diarrhea, *Dulcamara* 6th may be preferable to *Chamomilla*. If the children should cry uninterruptedly, twist themselves, draw up their legs, etc., a single dose, or, if necessary, several doses of *Colocynthis* are the most appropriate remedy. If *Colocynth* should prove ineffectual, and there should be great restlessness, tossing about, colic, *Jalap* 3d, may be resorted to. For flatulent colic with violent crying, vascular excitement, sleeplessness, I have found *Senna* 3d useful.

" These few indications will be sufficient to convince the beginning practitioner that it is not such an easy thing to be a successful physi-

cian of children, and that it is absolutely necessary to prescribe a remedy that shall exactly respond to the internal nature and external form of the disease, if he expects to perform a brilliant cure and to enjoy the consciousness of having relieved the sufferings of the most beautiful and most interesting portion of humanity.

"New-born children will sometimes cry a good deal without any apparent cause. This is frequently owing to excessively tight bandaging, or they feel too warm, or a pin pricks them, or there is some other cause in existence which should be investigated and removed. Sometimes, however, children will cry day and night for weeks, without any cause being discoverable. Under such circumstances *Chamomilla* 12th, or *Belladonna* 30th will stop the crying, sometimes after a single dose. *Chamomilla* should always be tried first. It will frequently happen that the child's sleep is disturbed by some accidental cause and that it will become restless and cry, and not be able to go to sleep again in spite of its weariness. *Coffea* 6th, will prove a real specific for this irritated state of the child's nerves.

"Another trouble to which children are sometimes subject, is a sudden loss or stoppage of breath (so-called liver-grown). This difficulty may arise from an inflammatory condition of the thoracic or superior abdominal organs. It may likewise be caused by an accumulation of wind in the stomach and the upper portion of the bowels, or by the presence of some other gastric derangement; or it may be an accompaniment of a spasmodic condition. Generally such a condition arises from a cold or from exposure to a sharp wind. The praecordial and subcostal region is so tight and swollen that external pressure causes anguish, shortness and even loss of breath. The child is very restless, twists about, first draws up its legs and then stretches them again with violence, and cries incessantly. A very small dose of *Chamomilla* removes the difficulty. Rubbing the swollen parts gently with the palm of the hand, facilitates the cure; but the thumb should not be used for this purpose, as coarse nurses will sometimes do."

Hering says, for colic in children, with anxiety, *Aurum*, *Calcarea*, *Phosphorus*, *Chamomilla*. Teste says, when the principal seat of the pain is a fixed point above the umbilicus, pulse normal, face pale and pinched, *Cina* is the specific. It should be given from the ninth to the twelfth dilution, a few globules in a glass of water; four teaspoonfuls in the space of an hour. See Food, Indigestion, Gastritis, etc.

CHOLERA INFANTUM.

Definition.—This is a true infantile cholera characterized by severe vomiting, purging, rapid prostration, and collapse. A distinction should be drawn between what ought to be called cholera infantum and that affection which is properly styled simple inflammatory

diarrhoea, or entero-colitis. Many physicians are in the habit of designating the various intestinal disorders of children so frequent during the summer heats, under the common title of cholera infantum. It is certainly evident that a large majority of the deaths registered in our mortality returns under the title, are the result, not of a true cholera disease, but rather of entero-colitis a disease of very frequent occurrence, almost solely during the summer months in young and generally teething children, who have been previously healthy, or subject for a longer or shorter time to simple diarrhoea.

Cholera infantum is manifest by sudden muscular debility, occasional nausea, spasmodic griping pains in the bowels, depression of functions of respiration, and an appearance of faintness, copious purging of thin, serous fluid, or of large watery and foetid evacuations, succeeded by more or less obstinate vomiting, coldness and dampness of a part of the whole surface of the body, coldness and lividity of the lips and tongue, cold breath and a craving thirst, a feeble, rapid pulse, difficult and oppressive respiration, with extreme restlessness; diminished or suppressed urinary secretion; pallor of the entire surface of the body, a sunken and pinched countenance; weakness of the cry, or partial aphonia, and collapse more or less complete, which may prove fatal, or be followed by reaction and more or less severe and obstinate diarrhoea.

Frequency.—This disease is not so common as simple and inflammatory diarrhoea, most cases of which have been improperly grouped under the common name of summer complaint. It is rare in Europe compared with its frequency in this country. In the former it has been described as follicular enteritis and apyretic and febrile follicular diacrisis, and choleriform gastro-intestinal catarrh.

Causes.—The most influential *predisposing causes* are the heats of summer, the impure air, and want of ventilation of cities, dentition, improper diet, early age, and hereditary influence. That the heats of summer, constitute a powerful predisposing cause to the disease is proved by the evidence of almost all writers, and by the fact that the disease occurs in its most characteristic and peculiar form only during the warmest months of the year. It is universally agreed that the disease is most frequent and fatal in the months of July and August, that it is much less so in June and September, and that in May and October it is seldom met with. That it is not the heat of the season alone, however, is proved by the fact that the disease is less frequent and fatal in some of the southern cities of our continent, than in some northern cities, as is proved by statistics.

So long as the atmospheric temperature is moderate, the resulting disorders will probably take the form of simple or inflammatory diarrhoea. But let the temperature rise to 85 or 90° F. or even higher, as happens occasionally during the summer, and continue at this height for three or four days, and children previously well will be seized with the true choleraic forms of the diarrhoea, whilst those who are already suffering from simple or inflammatory diarrhoea are prone to these milder diseases, assume suddenly the choleric type. Carefully tabulated statistics show that so-called cholera infantum causes nearly as many deaths as convulsions during the first fifteen years of life, and rather more than twice as many as pneumonia.

Dentition was supposed to be a powerful predisposing cause for the disease, and yet it would seem to be less influential than age, for the tables of Drs. Emerson and Condie show that the disease is about twice as fatal in the first year as in the second, though the process of dentition is certainly more active and continuous in the second than in the first year. The disease is rarely observed before the beginning of the process of dentition, and is certainly very rare after its completion, when the child's food is less milky.

Age, as has just been stated, exerts a strong influence in the production of the disease. In the tables of Dr. Emerson, the cases of cholera, but as all cases of the disease under five years of age are called cholera infantum, the want of the distinction does not make the statements less useful to us. From them it appears that there were 2122 deaths in the first year, 1186 in the second, and only 268 between the second and fifth. Between five and ten years, only 52 cases are noted, and these would of course be entitled cholera morbus. Dr. Condie reports 1706 deaths in the first year, 752 in the second, 125 between two and five years, and nine after that age.

There are no means of ascertaining the exact proportion in which the disease occurs in the opposite sexes. Of seventy-seven cases recorded, forty-eight occurred in males, and twenty-nine in females. It would therefore appear to be more common in males than females.

The chief exciting cause is fermentation of the nitrogenous portions of the milk, it seems to the author, due to heat and a negative electric condition of the atmosphere. The poison generated is undoubtedly a cyanide.

Improper food is another frequent cause of choleraic disease in hot weather. Sudden weaning, a change in the character of the artificial food, the unfortunate use by accident, or by the carelessness of the

nurse, of sour milk, of improper vegetables, or as not unfrequently happens, of green or unripe fruit, will sometimes bring on in a very few hours, the most violent attacks of cholera, or convert a previously mild and comparatively safe diarrhoea into the most violent form of the disease we are considering. These results are especially apt to follow such accidents or imprudences in large cities, where the hygienic conditions are always in summer of a kind to invite the more violent and dangerous forms of intestinal disorder.

M. Barrier states that the use of starchy substances, often ill-cooked or sweetened with too much sugar, as diet, is one of the most frequent causes of the follicular diacrases of young children. This agrees exactly with the opinion of M. Valleix as to the most evident cause of enteritis and thrush, so fatal amongst the children of the Foundling's Hospital at Paris. He states it to be *improper alimentation*, and particularly one consisting of feculent materials. He adds that he has never known a child nourished exclusively at the breast during the early months to have the disease. (*Guide du Med. Prat.* t. iv. p. 60). The use of too indiscriminate a diet during the second year is another frequent cause of the disease. I have several times known it to follow the giving a child the smallest quantity of fruit. For a more detailed account of the influence of diet in the production of diseases of the intestines in children, the reader is referred to entero-colitis.

Observation leads to the belief that the disease is apt to occur in certain families. It would seem probable that this peculiarity, if it exists, must depend on the fact that the constitutions of some families are particularly disposed to disorders of the digestive apparatus. As an example: In one family eight out of ten children suffered more or less from the disease. Of these children, four grew up, married, and had children. Two of these families each lost a child from the disease; in a third, the two children of the family were exceedingly ill with it; while in the fourth, some of the children were sick, though not to the same degree.

The *local* conditions most certain to cause cholera in children are:

1. Decaying organic matters, bone, hide, fat and offal houses, neglected stables, putrescent mud and filth.
2. Bad drainage, local dampness and malaria.
3. Obstructed sewers, filthy streets, gutters, garbage and cesspools.
4. Water and beverages in any manner contaminated by putrescent organic matter, particularly by any soakage from privies.
5. Neglected privies and putrefying excrement.
6. Overcrowding and defective ventilation, or in a word, acidity. It is

just where these conditions are most rife, that the cholera disease in children is apt to occur. Amongst the poor who inhabit the crowded quarters of cities, where the streets and alleys are small and narrow, where heaps of decaying and organic matters abound, where water is scant or scantily used, where ventilation in the manner in which the streets are laid out, and from the crowding together of buildings, is necessarily imperfect, we have the most numerous and severest forms of the disease. Add to these the small size of the houses, the low ceilings, the small and few windows, and the interior arrangements of the rooms, which is such that a thorough draft is unattainable, and we need not wonder at the prevalence of the disease. It is amongst the poor too, that food is often of necessity as well as from ignorance and recklessness of the most improper kind, and not unfrequently insufficient in quantity. But not only the poor in their unhappy lot suffer from this disease. The children of the rich with all the advantages of the most wholesome hygienic appurtenances which ease and knowledge can supply, are apt to contract it if they remain in town during the summer months. So well is this known that most families in easy circumstances, leave the city for the seaside or the interior, so long as their children are young, remaining absent usually from the middle of June to the middle or end of September. It is nevertheless true that whilst all the residents of our cities during the summer season are liable to see their young children suffer from this disease, those who are so fortunate as to occupy large and airy houses in the best and cleanest quarters, and who follow a wise system of hygiene, as to diet, water, dress, and exposure to fresh air, escape with much more certainty the disease, than those who are compelled by the necessities of their position to submit to the unhealthy conditions mentioned above.

Anatomical Lesions and Pathology.—It will be readily understood, that, it is far from an easy matter to define precisely what are the essential lesions in time of cholera infantum. Having been confounded so long with entero-colitis, the lesions usually attributed to it are precisely those belonging to the latter affection. In those cases where the true choleraic disease appears during the course of inflammatory diarrhoea, it is of course difficult to determine to which affection the lesions presented after death are in reality due. The pathologist must therefore seek for the true and proper lesions of cholera infantum in the comparatively rare cases in which this affection has appeared in the midst of good health, and has proved fatal

during the acute stage. With this restriction then it appears that the only intestinal anatomical changes which can be regarded as constant and essential to the disease, are enlargement of the mucous follicles, and to a less degree of the glands of Peyer; and softening, and in some cases, erythematous inflammation with peeling off of the epithelium of the mucous membrane. There can be but little doubt that the appearances thus indicated depend upon the presence of an early stage of inflammation of the tissues of the intestinal walls, and of the mucous follicles. This view is supported by the similarity between these lesions and those found in cases of entero-colitis proving fatal during the early stage, as well as by the fact that where the child survives the choleraic stage, and ultimately dies after a continuance of diarrhoea for some days, or even several weeks, the lesions are found to have developed into those ordinarily found in primary entero-colitis. It is however, necessary to consider briefly what additional element is present in this form of disease which impresses upon it such peculiar and fatal features, or in other words, what is the pathology of collapse which characterizes cholera infantum. It is a matter of regret, that as yet we are wanting in careful microscopic examinations of the condition of the epithelium of the mucous membrane, and of the character of the evacuations. We should anticipate from the evident similarity between cholera infantum and sporadic cholera, or cholera morbus in the adult, that in the former, as in the latter disease, such examination would reveal rapid proliferation and exfoliation of the cells of the mucous membranes. Through the kindness of I. N. Danforth, M. D., of Chicago, pathologist, the accompanying illustration of a cholera tornado among the villi of the intestines is here given. We infer that similar destruction occurs in true cholera infantum.

In regard to the explanation of these lesions the view has already been expressed that the causes of these affections (heat, noxious emanations, unwholesome food), act in a complicated manner by inducing a state of malnutrition, in which the tissues are prone to undergo destructive changes, by loading the blood with noxious substances, which may irritate the glands which secrete them, and finally by interfering with digestion, so that the contents of the intestinal canal undergo changes which render them highly irritating.

It should be recognized that in cholera infantum that there is present a general alteration of nutrition, and the change in the entire blood mass, as well as the local irritant action of the morbid contents of the intestines. But it is in the highest degree interesting and signi-



FIG. 1.



FIG. 2.



FIG. 3.



FIG. 4.

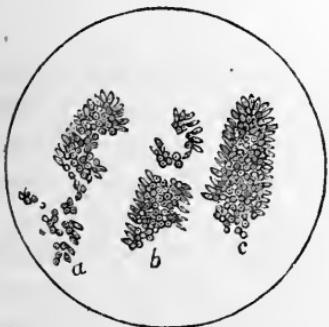


FIG. 5.

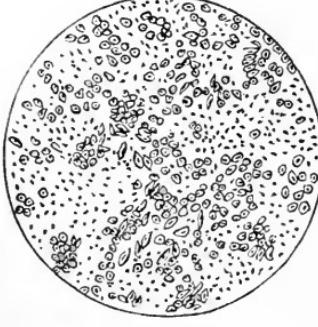


FIG. 6.

THE EFFECTS OF A CHOLERA TORNADO.

FIG. 1 represents healthy villi, during the interval of intestinal digestion. FIG. 2 represents a section from the middle third of the ileum of a man who died of cholera, in Chicago, 1873. FIG. 3. Section of the ileum six inches above the ileo-caecal valve. FIG. 4. Section immediately above the valve. The torn and ragged appearance is no exaggeration: "Not a single perfect villus could be found." FIG. 5 shows the cohering cells after being stripped from the villi; (a) considerably broken and torn, (b), less so; (c), the entire cell-covering of a villus "pulled off." FIG. 6. The intestinal contents being composed of fully developed, conoidal cells, half-grown conoidal cells, white blood corpuscles, altered red blood corpuscles and multitudes of minute granules, all floating in serum. 200 diameters.

If rapid peristaltic action, from cholera poison (a cyanide), can produce such results in a mature intestine, what must be the effect in a delicate child attacked with severe cholera infantum due to a similar poison. We can understand why convalescence will be tedious and relapses occur.

fificant of the importance of the last element in the causation, that symptoms altogether indistinguishable from those of cholera collapse, may be produced by agencies acting directly and solely upon the coats of the stomach and intestines. In the Med. Chir. Trans. Vol. LI, pp. 1, 1868, an article entitled "On Some Analysis of Cholera," Dr. Sedgwick shows that poisonous doses of *Corrosive sublimate*, *Arsenic*, some of the mineral acids, especially *Nitric acid*, and certain drastic purgatives, especially *Croton oil* produced the symptoms which are uniformly described as closely analogous to the cholera collapse; and were no doubt due to the direct irritant action of the substance upon the gastro-intestinal mucous membrane, (Meigs, and Pepper). These effects are familiar to the Homœopathist, who knows that not only these, but many other drugs produce a like effect, especially *Camphor* and *Veratrum*, and that when administered in smaller doses, in conformity with the law of *similaris*, they relieve the cholera collapse.

The same effects have frequently been observed to follow the eating or drinking of poisonous animal matters, such as sour milk, meat or fish, which has undergone some injurious, but as yet unknown change, decomposing vegetables and some of the poisonous fungi. In this last group, the local irritant action of the substances swallowed must certainly be regarded as the principal cause in the production of the symptoms, although it is quite possible that the ingesta of such putrid animal or vegetable substances, should also cause an alteration of the blood. In like manner, there are numerous morbid conditions of the intestines or their peritoneal covering, (as perforation with subsequent peritonitis, from extension of the inflammation, intestinal obstruction) which may be attended with symptoms closely analogous to those of cholera collapse. (Meigs, and Pepper).

At the same time the probability is that the vaso motor nerves of the intestinal walls themselves are paralyzed from exhaustion of their excitability, so that dilatation of the vessels occurs with profuse discharge of serum, and as if in confirmation of this, both Moreau and Asp have found that after section of the branches of the sympathetic vein supplying the intestines, a copious secretion of alkaline serous fluid takes place in the bowel.

The symptoms of cholera infantum vary with the three stages of the disease. In the first stage, the symptoms are those of indigestion, usually attended with nervous erythema. This stage is of so brief a duration usually, as to be overlooked. The invasion of the second stage, or of the choleraic symptoms proper, is sudden. The child may

have been, or supposed to have been quite well previously, or may have been the subject for an indefinite length of time—days or weeks—of entero-colitis, when from exposure to high summer heats (85 to 95°F.) in a city, or more rarely in the country, from being allowed to take some unwholesome article of food, from the effort of cutting teeth, or perhaps from having been chilled by night air, or by a sudden change of the weather from hot to cool; the choleraic poison has been developed, and the disorder breaks out with almost simultaneous vomiting and purging. The diarrhoea is from the beginning violent. In many cases the excessive irritability of the stomach continues throughout the attack, but not unfrequently the vomiting becomes suspended at a more or less early period, while the diarrhoea continues unabated, or increases in violence, both continuing without any seeming effort or pain. The matter vomited at first consists of the ordinary contents of the stomach, food and water. Soon these matters consist of water that may be taken, and of a serous or sero-mucous fluid, mixed with small portions of bilious matter, and tinted green. The vomiting may not be very frequent, or it may be one of the severest symptoms of the disease, causing everything taken to be rejected almost as soon as swallowed, or assuming the form of repeated and exhausting retching even when the stomach is quite empty. There is great thirst, in fact it is almost insatiable, and if attempts to satisfy it are made by administering large draughts of cold water, the vomiting is greatly facilitated, and the fluid is rejected almost without an effort. The abdomen is flaccid or retracted, not tender to the touch usually, and the walls inelastic, so that they can readily be pinched up into folds. At a more or less advanced stage it becomes tympanitic and tense. The stools are usually frequent, consisting almost entirely of a thin fluid which runs through the napkins, and wets the cloths of the child. Sometimes the discharges are not very frequent, but each one may be so large as to wet the napkins and clothes of the child, and to run through to the lap or bed on which the patient lies. The chief and important characters of the stools in true cholera infantum as in cholera of adults, are their fluidity and quantity. These two characters more than the vomiting or the nature of the discharge in any other respect, are the special signs of the disease. The fluid of the stools may be of different character. It may be an almost colorless liquid, merely wetting the napkin and clothing as though they had been dipped into a bucket of water, or saturated with the pale urine of a healthy infant, or they may consist of the same watery

fluid holding in suspension small and soft flocculi of fecal matter of a yellowish or greenish color, or small detached portions of mucous, which are left upon the napkins as the watery fluid drains through them. When the stools are of this kind, they are usually almost inodorous. In other cases, they are still very watery, but the fluid is yellowish, or brownish in color, contains rather a larger amount of thin feculent matter, and has a most offensive odor, an odor which is peculiar for its extreme fetidity, a fetidity so great that it occasionally causes vomiting in those exposed to it, and so adhesive as to render it necessary to change at once all the clothing and bed linen of the child and even then the fetor may cling to the body of the patient after repeated washings. The number of stools will vary in different cases from an hourly occurrence to greater intervals. In some cases though not very frequent, the quantity may be so great at each time as to drain the body of its fluids at a more rapid rate than more evacuations of an ordinary quantity. Eight, twelve, fifteen or twenty stools in the twenty-four hours are not rare.

In the third stage the urine becomes notably lessened, and in the severe cases ceases to flow, or flows only in the smallest quantities. The pulse is quickened from the first, and as the disease progresses, becomes very frequent, rising to 130, 140, 150 or more, and is at the same time small, quick and tense. It becomes feeble, rapid, and sometimes remittent in cases of a fatal termination. The respiration soon becomes irregular, unequal and anxious. The skin is in general dry and harsh; the head and abdomen are hot, while the extremities retain their natural temperature, or when the attack is violent, are decidedly cold. The sleep is restless and disturbed, especially at night; the child wakes frequently, and almost always with crying. When asleep the eyes are but half closed, and the brow contracted and frowning. Unless the attack be very slight and of short duration, there is always manifest emaciation. When the disease is grave the emaciation makes rapid progress in a very few days. The skin assumes a wilted appearance, and hangs in folds about the neck, and especially over the internal surface of the thighs. About the time that this emaciation takes place there often appears œdema of the feet and sometimes a bloated condition of the face. Simultaneously aphthæ and thrush appears upon the tongue, cheeks, gums, roof of the mouth and pharynx, the anus is excoriated by the acrid discharges, and petechiæ sometimes make their appearance upon the skin, especially the parts upon which the patient rests. The eyes are languid,

glassy, and deeply sunken in the orbits. The nose becomes sharp, and pointed, and the lips thin, dry, and shrivelled, the skin upon the forehead is smooth and shining, as if tightly stretched over the frontal bone. The child lies constantly in an imperfect dose, with half-closed eyelids, and so insensible to external impressions that flies alight upon the half-exposed eyeballs without the patient exhibiting the least consciousness of their presence. A cold sweat shows itself upon the forehead or other parts of the body, and the fontanelles becomes greatly depressed. The fauces frequently becomes dry, causing considerable difficulty in deglutition. The signs of collapse becomes more marked as the disease marches on, the body becomes cool and then cold, the pulse grows smaller, thready and very rapid, the features become sharper, the head is constantly rolled from side to side, the child falls into a comatose state, and death occurs quietly in this condition, or may be preceded by slight convulsive movements.

Duration.—Some very violent cases run their course in a day, a day and a half, or two or three days, the average time being four or five days. In favorable cases, after one, two or three days, the diarrhoea ceases to be so violent, the stools grow less frequent, smaller in quantity thicker in consistence, and regaining a more natural odor. The vomiting and thirst gradually subside, food is again taken and retained, the circulation falls, and the child though weak and thin, and the subject for some days of a simple diarrhoea, may regain its health again in a great measure at the end of a week or ten days. More frequently, however, the disease assumes the form of a more obstinate, simple, or inflammatory diarrhoea which may last for several weeks, to take on again, perhaps, from a recurrence of the exciting causes, the choleraic form, or to persist in one of the former shapes until the return of cool weather.

Diagnosis.—The diagnosis of true cholera infantum requires no particular elucidation. The season at which it is most prevalent, the profuse serous, or at least fluid evacuations; the frequent and severe vomiting; the early exhaustion of muscular strength; the rapid pulse, with absence of, or a very moderate febrile heat; the threatening or the actual supervention of collapse, marked by cool or cold surface, pinched and anxious countenance, shrivelled skin, sighing or irregular respiration, rapid or feeble or extinguished pulse, diminished or suppressed urinary secretion; with finally the still and limpid body, and drowsy or comatose brain, all mark a disorder which is readily recognized after being once seen.

Prognosis.—Cholera infantum is always a dangerous disease. The poisoning and the subsequent collapse, which either threatens all who are attacked by it, or actually supervenes to a greater or less degree, as is well known by all physicians to be one of the most formidable morbid conditions to which the body is liable. The degree of danger in each individual case must depend chiefly upon the ability of the physician to arrest, and of the patient, to resist this state. The probability of the prevention of collapse depends very much upon the hygienic condition in which the child is placed, upon the age of the patient, the date of the process of dentition, the present state of health, the innate vigor of the constitutional force, and also we may say upon the period of the disease, and the degree of wisdom with which medical means are applied. Children placed in favorable hygienic conditions in the country or in the healthier part of cities, in large and well ventilated rooms, and who have been fed upon proper diet, and who have therefore been attacked by the disease whilst in previous fair health, are much more apt to escape collapse, or to recover from it after it has made its appearance in a more or less marked degree, than those who are placed in conditions the opposite of those we have enumerated. Early age, recent weaning, improper artificial diet, and feeble vital powers, from any cause, either inherent or acquired, are amongst the most unfavorable prognostics. Still we should never despair until the last moment, since there have been surprising recoveries from apparently desperate conditions in this disease. The prognosis may be stated in general terms to be unfavorable in proportion to the frequency and violence of the vomiting, the number of the stools, the severity of the fever, and the more or less marked character of the collapse. When the discharge consist merely of serous fluid, and are copious and frequent, when they consist of quantities of deep green matter, mixed with much mucus or with blood, when accompanied by straining, when they number from fifteen to twenty-five in the day, when they are very fetid, and when with these symptoms the abdomen is tense and tympanitic, the countenance pinched, the expression languid, the extremities cool, the pulse rapid and small, and the child irritable and restless, or, on the other hand, very still and subdued, the prognosis is very bad. If after the symptom just enumerated, drowsiness or stupor, and then coma, convulsions, rigidity or paralysis make their appearance, there is scarcely a hope left.

The favorable symptoms in a case are : Diminution of the fever ;

equal temperature of the whole surface; cessation of vomiting; decrease in the number of the stools, and a return to their natural color, consistence, and odor; quiet, tranquil sleep; return of appetite; and lastly, a restoration of the natural temper and gaiety of the child.

Treatment.—Prophylactic Treatment.—The danger to which young children especially when teething are exposed from residence in cities during the hot months of the year, is now so well understood, that nearly all parents who can afford and make it at all convenient, remove to the country during the warm season, and by this course very generally avoid the disease. It is undoubtedly the best plan that can be adopted, and very commonly succeeds. When it cannot be done, however, the prophylactic treatment consists in the most careful attention to diet, dress, and exposure to the open air. If possible, the supply of milk being adequate, the child should be kept at the breast until it has passed through its second summer, as there is less danger from the disease after that period. If the weaning must take place prior to this time, it ought to be accomplished before hot weather begins, as a change from the breast to artificial food during the warm season is very apt to bring on the disease. If the child is weaned, the diet must be strictly attended to. Up to the age of ten months or a year, the food should consist almost wholly of milk containing arrow-root, rice, oatmeal, or some farinaceous substance in small quantity. A little plain chicken or mutton water, with rice boiled in it, or a piece of beef or chicken to suck, may be given occasionally, but all vegetables and fruits should be strictly forbidden. After the age of ten months, some light soup and small portions of mutton, chicken, or very tender beef, minced very fine, may be given every day in addition to the milk food, which must still form the major part of the child's nutriment. Fruit of all kinds, all vegetables except rice and potatoes, and the latter are doubtful, ought to be carefully avoided until after the hot season has entirely passed away, or until the child has its full set of teeth.

During bursts of hot weather extra care must be taken that the milk given the child is sweet. Extreme caution will be needed in electro-negative cloudy weather with thunder, as then the milk changes easily and rapidly. If the child is bottle-fed, the milk must not stand five minutes in the bottle. The sulphur in the tube or nipple starts chemical decomposition so that in fifteen minutes the milk is changed, and the powerful cyanide poison undoubtedly generated.

The dress ought to be arranged according to the heat of the day. It is the fashion with some people to keep young children clothed all summer in thick flannel jackets and petticoats, and woolen socks. This is certainly too much for the hot days which so frequently occur in July, August, and early in September, and is often very injurious. A light gauze flannel shirt is the only woolen garment that need be worn during the warm season, except a flannel band. On hot days a child should have only this, a muslin petticoat and frock, and the lightest possible socks, or none at all. If, as constantly happens in our climate, a cool day comes, there should be added to these a light flannel petticoat.

It is of the utmost importance that children should pass as large a portion of the day as possible in the open air. In the country this is easily managed, and parents almost always contrive to accomplish it ; but in a city, many people seem to think it of less importance, or their servants are occupied with other things, and it is neglected. It is nevertheless a matter of the greatest consequence ; the child ought to be kept in the air by the nurse a large portion of the day ; either in the garden attached to the house, if there be one, at the front door, walking the streets, or, better still, making little excursions into the neighboring country, or lake, river, or ocean, taking care, however, to avoid the intense heat of the sun during the middle of the day.

With constant and wise attention to these points, diet, dress, exposure to the air, and exercise, much may be done in the prevention of the disease even in families obliged to remain in the city during the summer.

As has been stated before, the choleraic disease often supervenes in children, who have always been the subjects of simple or inflammatory diarrhoea. When therefore a child especially if it be in the city, does not yield readily to treatment, and especially if the stools begin to be thin and watery, with any marked tendency to exhaustion it ought to be regarded as being threatened with cholera infantum.

Hygienic Treatment.—The child should be kept as quiet as possible. It should lie in a constantly horizontal position, on a smooth and easy mattress in the crib, or on a large, roomy bed, and as little as may be on the lap, which is uneven and unsteady, and which must give its weak and exhausted muscles more work to do than they would have on the more solid and even bed. Besides the lap increases the heat. If however the child should manifestly prefer the lap to any other position, it will be better to yield to him rather than cause fretting,

when his very life may hang upon the avoidance of all disturbing influences. In this case it is well to place him upon as firm a pillow as can be found, and let him be held on this in the lap. It is important to move him when this becomes necessary, as slowly and as gently as possible, always keeping the body on a horizontal plane, to avoid the tendency to the syncopal state, which sudden movements, and especially the sitting or erect position, are apt to produce. We should be as careful on this point as we would in a case of diphtheria. When the tendency to cooling of the body shows itself, noticeable at first at the hands, feet, ears, and nose, it should be kept wrapped in warm, dry and soft flannels or blankets. Flannels heated at the fire, thus supplying dry artificial heat, are of great use here. Bottles or tins filled with hot water ought to be placed at the feet, under the blanket. Whilst artificial heat is thus made use of, fresh air should not be excluded, and as these cases occur during the hottest weather, the largest supply of fresh air should be admitted. The warm arm of the mother placed along the child's spine is invaluable. Warm baths, which were proper and useful during the early stage, especially when fever is present are not useful at this period, as the fatigue and irritation caused by undressing and dressing does much harm.

When the case takes a favorable turn and the reaction stage begins, perfect rest should be enjoined, and food and water administered carefully and judiciously. The food may be cautiously and slowly increased in quantity, if the stomach has become settled. Table-spoonfuls of thin chicken tea flavored with salt, or of Liebig's cold extract of beef, or of light beef tea, or of a mixture of wine-whey, with two or three parts of arrowroot decoction (a teaspoonful to a pint), may be given every half hour or hour. If these are retained several times, and the child shows some little anxiety for food, the same materials may be given in wineglassful quantities. At the same time water and ice ought to be allowed from time to time as the thirst may call for them. On the second or third day of the reaction, we may give, if the child shows a desire for it, a little milk and water, one part of milk to one or two of water, or flour gruel well cooked, (to which a little soda or lime water may be added) commencing with not more than two or three ounces of the mixture at each feeding. The milk ought certainly to be very much diluted for the first three or four days after it is allowed. When the child has been carried thus far safely, we may gradually return to its former habits of feeding, allowing meat to suck, a little bread, and so on, if

it is old enough for such food. When reaction is thus successfully brought about, the child may either improve rapidly, and regain its previous health, or simple or inflammatory diarrhoea may set in and pursue the usual course of those disorders. (Meigs and Pepper). Indigestion and its attendant evils are especially to be guarded against. Beyond all other diet for infants is that afforded by the healthy, good-tempered mother, next to which is that of a good wet nurse. Should she be sickly, nervous, or ill-nourished, and the child shows signs of insufficient or perverted lactation on the part of the mother, and her condition and that of the milk cannot be improved, it should be weaned at once, and if a wet nurse cannot be had, artificial food should be substituted. Many infants are attacked by cholera infantum who are thus nursed as well as those "brought up by hand," and it will be no small part of the physician's duty to adopt food towards each individual case, for he will often realize the old adage in finding that what agrees with one child, will only aggravate the situation in another. The general question of food has been treated upon elsewhere, and we shall now only allude to the dietetics of the disease under discussion.

In considering the adaptation of food to the infantile organism during the occurrence of cholera infantum, as in fact of all intestinal diseases in which there are frequent and morbid discharges, it should always be remembered that,

Firstly. However agreeable and nutritious any diet may be to-day, rotation of the bill of fare is sure to be required at some time, or disgust, indigestion, etc., will follow.

Secondly. The food must be composite, nitrogenous as well as carbonaceous, to supply at once flesh, fat, and animal heat.

Thirdly. It must not appear in the stools, undigested, or be vomited. Quality or quantity, either one, may be in fault, and must be rectified, and to this end a personal inspection of the stools should be made.

Amongst the special articles, one of the first to be named is pure cream. But cream from the cow, as well as milk, is liable to dangerous contamination from the weeds of the pasture. And even pure rich cream may prove unacceptable, causing vomiting, and then warm water should be added, with a little white sugar, or sugar of milk. But the whole stock should not be diluted at once, since the process of putrefaction is thereby favored. In summer it should be preserved on ice in glass or porcelain vessels of fastidious cleanliness.

No tin vessels (see *Stannum colic*), should be used. If gastric irritability should be very marked, very small quantities of this or any other nutriment are to be given at any one time, but frequently as the stomach will bear without vomiting or disgust, say a teaspoonful every half hour. In some rare cases the rectum may supersede the stomach as the receptacle of food,—of which yolk of egg with cream is probably the best form, two teaspoonfuls being injected every two to four hours for a little child.

The curd separated by rennet, or the whey produced by the same means, are by no means valueless, and as there is probably a certain amount of modified pepsin contained in each of them, and being thus half digested as it were, they may therefore be more manageable by the enfeebled organ than the original milk. Goat's milk very frequently agrees well with the infant, when cow's milk only proves irritating. Condensed milk has of late come into great favor, and has very much to recommend it, during very hot weather. Properly prepared it is often the salvation of the child, when everything else seems of no avail. If the child vomits rancid matter, milk in any shape must be avoided, for a time at least. In using each or any of the varieties of milk, the utmost care must be exercised that the vessels containing the milk in bulk, or those used while feeding, should be properly cleansed, and scalded with hot water, as soon as they have been used, and the same holds true with rubber nipples and tubing, which should be thoroughly cleansed with water containing a little lime-water, or table salt. All such rubber appliances should be kept submerged in a bowl of water when not in use, in which is dissolved a little soda.

Therapeutics.—On account of the confusion arising from not properly identifying this disease, the therapeutics is also in confusion. Cholera infantum being essentially a disease of poisoning, really needs few remedies, but those must be powerful and effective.

The first stage of this disease is rarely recognized, being that of nervous erythema, and is attributed to heat, teeth, or indigestion. The remedy here may be *Belladonna*, *Coffea*, *Aconite* or *Chamomilla*. The child should be fed sparingly till the nervous excitement is over. Overfeeding during this stage, especially if the weather is hot and lowering, will usher in the second stage with tremendous violence. Hydrocephalic symptoms may be its first expression, and here *Hellebore* and *Bryonia* are very efficient.

The second stage is easily recognized and has a few similar remedies.

Great care however, must be exercised in their selection. No routine treatment will do here. Dr. Poulsen says; (*U. S. Med. Invest.*, Aug. 1st, 1878, No. 219, p. 124). "*Chinium arsenicum* is beyond doubt the only true specific, and next to that comes *Kreasotum*. The first during hot weather in malarious regions, and the second during dentition." He thinks that these two remedies will cure seven-eighths of all the curable cases. He does not tell us how many are incurable, so the safest plan is always to select the truly similar remedy.

The second stage is easily recognized and has a few efficient remedies. Great care must be exercised in their selection. No routine treatment will do here.

Veratrum album is usually in a great majority of ordinary cases, the first remedy to be used. The characteristics calling for its employment are: Suddenness of the attack, large watery discharges from the bowels, and copious vomiting without apparent effort; cold clammy surface; cold perspiration on the forehead; great prostration following each attack of vomiting or purging; pulse almost imperceptible; the least quantity of liquid excites vomiting; cold sweat and cold breath; great thirst; colorless, watery evacuations, or greenish water with flakes; contraction of the soles of the feet and palms of the hands; hippocratic face.

Arsenicum is a valuable remedy and should be used in those cases in which there is violent gagging and vomiting, which, however, is not very copious—of watery, slimy, biliary, greenish-brown, or black matters; simultaneous vomiting and purging, thirst, with vomiting, immediately after drinking; takes but a small quantity of water at a time; lips are blue, cold and shrivelled; the breath is cold, nose pointed, cheeks sunken, face pale, cadaveric; cold, dry, shrivelled, and bluish skin of the body, pulse tremulous, and intermittent; small watery, very offensive evacuations, with tenesmus; suppressed urine; cold extremities; child is very restless, tosses to and fro.

Camphor.—In cases in which other remedies have failed, or where collapse is threatening or has taken place, the skin is cold as marble, yet the child will not remain covered; there may be neither vomiting or purging, but coldness and great prostration; cold spells coming on at night, and passing off in the morning.

Cuprum met.—Where there is a tendency to convulsions from the commencement of the attack; violent vomiting and retching from spasmodic muscular action. If the poison is a cyanide with which this remedy forms a precipitate, it should be given low.

Tabacum where there is icy coldness of the extremities, with hot abdominal surface, and the little sufferer does not seem satisfied until all the clothing is removed, (*Camphor, Hyoscyamus and Secale*) and the abdomen is exposed to the cold air, which seems to mitigate the vomiting, and nausea that is always excited by motion; deathly pallor of the face, and cold viscid sweat.

Tartar emetic is a valuable remedy in this disease, and should be given when there is almost incessant and profuse vomiting accompanied by a short, dry cough, rattling in the throat, apparent constriction in the pharynx, labored breathing; cold hands and feet, great pallor, child is drowsy, does not like to be disturbed, and *does not seem at all thirsty*.

Ipecacuanha is indicated by sudden paroxysms of great nausea and loathing; but vomiting, if it occurs is very scant, consisting of mucus and bilious matters, mixed with ingesta, diarrhoeaic evacuations of greenish yellow, slimy, lumpy matter, smelling sour, and having the appearance of being fermented; face puffed, distorted, red and hot, blue margins around the eyes.

Laurocerasus will be found adapted to those cases in whom there will be found a very slow, irregular, or imperceptible pulse, and when they drink, the fluid gurgles in passing down the oesophagus, like the noise made by pouring fluid from a bottle.

Secale cor.—Great debility, vomiting and diarrhoea; much thirst; pale face, sunken eyes, dry heat, quick pulse, restlessness and sleeplessness; involuntary stools, great aversion to heat or to be covered.

Pulte's treatment of cholera infantum, which he compares to cholera morbus in adults, is to give *Ipecac* and *Veratrum* in rapid alternation. If no better in two hours give *Arsenicum*. If the child tosses about add *Rhus*. If the disease goes to the head see third stage.

The third stage being that of collapse or reaction, the remedies indicated will necessarily vary. Those already given may be indicated in this stage also. The remedy must now clearly cover all the symptoms. If one cannot be found, alternation of remedies may be allowed. The following are the principal remedies with some of their indications. (H. V. Miller).

Asthma.—The milk disagrees and it is immediately vomited in coagulated lumps; after stool and vomiting, a semi-comatose condition; pupils dilated and insensible to light.

Apis.—Child screams out very sharply when asleep or awake. (Compare *Zinc*). Urine generally scanty or suppressed.

Arsenicum.—Great prostration; pallor; emaciation; great thirst with drinking, but little at a time; striking the head with the fist.

Borax.—Constant vomiting; painless stools; child makes an anxious face on account of downward motion.

Calcarea carb..—Leucophlegmatic temperament; fontanelles large and slow to close; muscles soft and flabby; much head-sweat during sleep; child makes an anxious face when lifted from the cradle.

Calcarea phos..—Complexion dirty white or brownish; skull very soft and thin, crackling like paper when pressed upon (craniotabes); peevish and fretful children (*Cham.*); diarrhoea with much flatulency during dentition; greenish thin stools.

Cuprum acet. or met..—Convulsions coming in the lower extremities, or in the fingers and toes, with much throwing about of the limbs, frothing at the mouth and choking in the throat; spasms preceded by violent vomiting of mucus.

Ipecac..—Constant nausea with occasional vomiting; stools fermented and of many colors, or as green as grass; paleness of the face and blueness around the eyes, catarrhal symptoms as concomitants.

Iris.—Great irritation of the gastro-intestinal tract: nausea and vomiting of sour fluid; colicky pains every few minutes in the epigastrium; stools thin, watery, copious, tinged with bile.

Kreasote.—Constant vomiting and greedy drinking; belching or hic-coughing when the child is carried. Teething.

Natrum mur..—Vomiting and diarrhoea; worse during the day; general emaciation; general emaciation of the cervical muscles.

Phosphorus.—Child drowsy, wants to sleep all the time; after drinking water, it is vomited as soon as it gets warm; stools white, green or watery, gushing out like water from a hydrant; loss of hearing.

Veratrum alb..—Cold, clammy sweat on the forehead; skin generally cold and damp; great debility; pulse very small and weak; great thirst for cold water; great prostration after stool.

Zincum.—Feet constantly fidgety; on awaking the child appears frightened, and its head rolls from side to side; during sleep it cries out (*Apis*) starts and jumps.

Jahr and Schwerkert depend upon *Phosphorus*, *Calcarea carb.* and *Zincum* as specifics in hydrocephaloid. Pulte's treatment in dropsy of the brain in cholera infantum is to give *Bryonia* and *Hellebore* till the child is lively. If there is a second attack or relapse, give the same remedies. If there is a third attack give *Opium* and *Sulphur* and then *Belladonna* and *Hellebore*, with cold water to the head. When the

bowels are relaxed *China* and *Phosphoric acid*. While routine treatment should not be followed, still it is often of service to know what has cured desperate cases.

When the disease is arrested we often have a difficult matter to conduct the child to health. It will either (1) recover at once, or (2) have a simple diarrhoea for a short time, or (3) have repeated attacks of indigestion, and finally may be attacked with entero-colitis. Much will depend upon the constitution of the child, the care it receives, and the food given, as well as upon the medical treatment. Cases occurring in the early summer months are often more difficult to conduct to convalescence, especially if the child is teething, than those occurring in August or September.

Two excellent remedies for this stage of the disease is *China* and *Phosphorus*. The latter may be given in the form of *Calcarea phosphoricum*, especially if the child is teething and threatened with relapse. *China* will be indicated by the great loss of fluids and the feebleness of the digestive organs. Its well known action on the liver (curing gall-stone) renders it a valuable remedy during hot weather when the liver is always larger than normal. If the child is nursing, the mother should receive the same medicine given to the child.

Careful study of Development, Physiology, Dentition, Food, Indigestion, Gastritis, Simple diarrhoea, Entero-colitis, Tabes mesenterica, Hydrocephaloid, Hydrocephalus, etc., should be made in this connection.

**ENTERO-COLITIS—INFLAMMATORY DIARRHOEA, ATHREPSIA,
SUMMER COMPLAINT.**

This is a disease of frequent occurrence during the hot months in America and France—two countries very similar as to climatic effects—and one that has been carefully studied by some of the best observers in both countries. Meigs and Pepper in their latest edition give the best epitome of this malady. This we incorporate with much additional matter and therapeutic experience.

Definition.—By entero-colitis or inflammatory diarrhoea, we mean that form of diarrhoea which presents during life, in febrile reaction at some period of its course, in marked constitutional disturbance and in the mucus, muco-purulent or muco-sanguinous stools, the proofs of inflammatory changes in the intestinal mucous membrane; and which exhibits after death the tissue changes in the small and

large intestines which are regarded as the products of inflammation of those organs.

Frequency.—The disease is one of the most common and one of the most fatal of childhood. Few young children die in the foundling institutions, or in the hospitals and alms-houses from insufficient or improper food, but die of this affection. Many, a large majority we think, of the deaths accredited to cholera infantum belong to this disorder. The true choleraic disease is frequently passed through with safety, but is followed by a long, obstinate, exhausting diarrhoea, which is in truth an inflammatory diarrhoea occurring as a sequel to cholera. A large proportion of the cases of summer diarrhoea are from the beginning, cases of this kind; or they commence as merely functional disturbances of the intestine, and run sooner or later into this disorder. It is one of the most important diseases of young children especially in this country, where our long summer heats, and the filthy condition of many parts of some of our most famous cities, give it a degree of prevalence and fatality which raise it almost to the rank of a pestilence. We believe that most of the cases of diarrhoea in children, no matter what may have been the exciting cause at the start; whether a constantly improper diet, as in hand-fed children, whether ill-judged experiments in new foods by the mother or nurse; whether the accidental use of unwholesome food, whether summer heats, exposures to unhealthy or foul exhalation, crowding, epidemic or malarial causes, dentition, residence in cities, or what not, are prone to end, are nearly certain to end, if they become chronic in this disease. It is confirmatory of the correctness of this opinion that in our armies during the late war, diarrhoea, whenever it became chronic, exhibited lesions which are best indicated by the term entero-colitis, if we are to use a name based upon the anatomical lesions of the disorder.

We may appreciate more acutely the importance and frequency of the disease, by reference to the statements of Rilliet and Barthez, who say that, taking into consideration all the cases they observed, including tubercular cases, they find that of every two children that die, one presents a more or less serious lesion of the large intestine. They add: “If it be recollect that this holds true particularly in regard to younger children, it will be seen that it is rare for a child to die between two and five years of age, without having either colitis or softening of the large intestine.” Bouchut states that entero-colitis is one of the most dangerous affections of children at the

breast ; " it is the most common of all those incident to that age."

There are two forms of the disease, the *acute* and *chronic*. The acute form is accompanied by active and inflammatory symptoms from the first, and runs its course in a few days or weeks ; the chronic form is unaccompanied by acute symptoms, and lasts several weeks or months.

Causes.—The most frequent cause is, improper alimentation and careless feeding. This may consist either of unhealthy milk, or improper artificial nutriment. The kind of food most apt to produce the effect is one composed exclusively or in considerable proportion of some of the feculent substances, which constitute so large a portion of the diet of children throughout the civilized world. To prove the truth of this assertion it is only necessary to quote opinions of those who have most carefully studied the subject. M. Valleix (*Guide de Med. Prat.* t. iv, p. 60, 61, and *Bulletin Gen. de Therap.*, article Acute Enteritis of Adults and New-born Children, March, 1845) clearly asserts that the most frequent cause of muguet, which he believes to be essentially connected with enteritis, is a too exclusively starchy alimentation. He says : " What proves that my assertion is not hypothetical is, first, that all the deaths from enteritis in children that I have seen, occurred in those who had been placed upon this kind of regimen, and second, that the disease did not occur in any of those observed by me in private practice for whom I had directed an exclusively milk diet up to four, five, or six months of age." He adds that M. Troussseau has arrived at similar opinions, after studying the same diseases at the Necker Hospital ; and that he, on account of the danger of a system of diet disproportioned to the digestive powers, recommends that children should be confined almost exclusively to the breast until after the first dentition is completed. Barrier, speaking of the follicular diacrisis (*Loc. cit. t. ii, p. 40*), states that the artificial food given to children at the period of weaning is a frequent cause of the affection, and that of all the different kinds of food habitually employed at that period, feculent substances are the most injurious. Meigs has frequently known entero-colitis to follow the employment of artificial diet either alone, at the period of weaning, or in children who were partly nursed. Children fed wholly on artificial diet from birth, rarely escape according to his experience attacks of the disease, which in many prove fatal. He has seen children recover rapidly from the disease, after suffering more or less for weeks, by the suspension of a diet consisting wholly or in too large a

proportion of farinaceous materials, and the substitution of one of milk and cream, prepared with gelatine, and containing a very small quantity of arrowroot, rice, or wheat flour. (See Food). It is not merely the quality, but the quantity also of artificial food that proves injurious to infants. Over-feeding has always been recognized as a fruitful source of bowel complaints in early life. Another cause is the preparation of the food in too thick and rich a manner, thereby overtasking the stomach, intended during the early months to receive only the thin milk supplied by nature. The custom, therefore, of feeding infants on thick oatmeal gruel, with but little or no milk, on what is called cracker victuals (pounded crackers with water and sugar or milk), on thick bread and milk, on preparations of rice of too solid a nature, or indeed, on any kind of diet not consisting chiefly of milk, and in which feculent substances enter merely as secondary constituents, may safely be asserted to be the most frequent cause of the disease under consideration.

An unhealthy character of the milk of the nurse is also known to be a cause both of simple diarrhoea and entero-colitis. When the granules which exist as a physiological element in the colostrum secreted during the first few days after childbirth, continue to be secreted after that period, the infant is almost certain to suffer from entero-colitis, and not unfrequently to perish, unless weaned or transferred to another nurse. When the mammary secretion is acid, instead of alkaline, when it contains mucus or pus globules, when the nurse is liable to vivid moral emotions of any kind, or when addicted to intemperance, the child is very apt to suffer either from the disease under consideration, or from simple diarrhoea.

That the heats of summer is a most fruitful cause of this disease is apparent from the time when it is more frequently met, *i. e.* in the months of June, July, August and September.

Reference has already been made to the work of Dr. Woodward upon camp diseases, (diarrhoea and dysentery), showing the perverted nutrition and essential lesions to be very much like the disorder we are describing. It may seem at first view, visionary and wild to compare the chronic entero-colitis or inflammatory disorder of childhood to the same disorder in armies and camps; and yet we think there is a most striking analogy between the two, as to causation, symptoms, anatomical lesions, pathology, and the results of treatment. The main causes are the same: improper diet, elevated temperature, the high temperature of the summer season in children, and of the south-

ern states in the armies ; overcrowding with foul air in camps and cities ; the symptoms are very much alike, a most obstinate diarrhoea, with great constitutional suffering and emaciation ; the same lesions are present, only less advanced and extensive in most cases of children, and very much the same results follow treatment ; as in both diet is found to be as important as drugs, and removal north in the armies, and in children, removal from crowded cities, and low, hot regions of the country to more elevated and cooler tracts, are found necessary. In children, as in armies, if at the beginning of the attack the patient is removed from the causes which have produced a simple diarrhea or cholera infantum, the case is likely to go no further ; but if the same causes are continued in operation, the simple diarrhoea passes gradually into the chronic inflammatory form of entero-colitis, and at last the patient recovers only when he is removed to a more favorable locality ; when the diet is changed to a more healthy one, or in the child when he drags through a long, hot summer and the cooler weather of October or November, and a diminution of the exhalation caused by the summer heats in cities being at least, in the course of nature the change which was essential to his recovery.

After the causes just enumerated, the one which appears to exert a strong influence in some cases, is dentition. That the evolution of the teeth, though a physiological process, is a predisposing cause of diarrhoea and enteritis, there cannot remain a doubt. It is one recognized by many of the most able writers and observers of the day, and by most practitioners. Rilliet and Barthez agree with Rousseau in the opinion that the simple diarrhoea so apt to occur in children at the epoch of the first dentition, is often the origin of chronic intestinal lesions which finally reduce them to extreme debility and emaciation. They say that careful investigation will generally show that nearly all the cases of inflammation and softening date either from the epoch of dentition, from the period of weaning, or from the time at which some considerable change in the character of the regimen was made. M. Bouchut states that of 210 children in whom the first dentition was going on, twenty-six escaped any indisposition, thirty-eight suffered from restlessness, colics, and occasional diarrhoea, so mild as to excite no alarm in the parents, while forty-six had abundant diarrhoea. In nineteen of the last series it appeared coincidently with the fluxion of the gums, occurring at the time of emergence of each tooth, and disappearing entirely in the intervals ; in the remaining twenty-eight, in

all of which the process of dentition was difficult, the diarrhoea persisted and gradually assumed the characters of entero-colitis. M. Legendre and M. Barrier (*Loc. cit.*) both agree in ascribing very great effect to the influence of dentition in the production of diarrhoea and entero-colitis. The former asserts the diseases referred to, to be much the more frequent between the ages of six or seven months, and two or two and a half years, which includes exactly the period occupied in the first dentition, while they are only met with exceptionally after three years of age.

The act of weaning is very apt to result in the production either of simple diarrhoea or entero-colitis, in consequence, no doubt, of the irritation set up in the gastro-intestinal surface, by the change of food made at the time, especially if the child is weaned in the early summer or fall months. The diarrhoea which occurs at this period was formerly, and is still, not unfrequently, called *weaning-brash*. Dr. Stokes (*Cyclop. of Med. Art. Enteritis*) says of this disease that it "is manifestly an acute enteritis, produced by the change of food, and in which nature seeks to relieve the inflammation by a super-secretion."

It is scarcely necessary to do more than state the fact that the unfavorable hygienic conditions above referred to, act as predisposing causes to the disease. This is clearly shown to be true by the evidence of many writers, and by the very extensive prevalence and great fatality of the affection in hospitals, and amongst the children of the destitute classes of society in cities and towns.

Entero-colitis is prone to occur as a secondary affection in many of the acute diseases of children. It is by far the most common in the course of the eruptive fevers, particularly measles, and in that of typhoid fever. It is also a frequent complication in the latter stage of pneumonia.

That children of feeble constitution and lymphatic temperament are more disposed to the disease than others, is sufficiently proved by the evidence of various observers. Lastly, that the incautious and excessive use of perturbing systems of medication, addressed to the digestive tube, often occasions diarrhoea and entero-colitis, is, it seems to me, fully shown by the researches of Rilliet and Barthez, and by recorded, personal experience.

Anatomical Lesions.—As already stated the alterations of the large intestines are, as a rule, much more frequent and serious than those of the small intestine. It appears from recent researches, that enteritis rarely exists alone, whilst colitis, by itself, or combined with

enteritis, is quite frequent. M. Legendre states that inflammation of the small intestines never occurs without corresponding lesions of the large bowel, while in twenty-eight cases of diarrhoea, he found the large intestine alone diseased in nine. From a table of different intestinal lesions, given by Rilliet and Barthez (*Loc. cit. t. i.*, p. 488), it appears that they have met with forty-five cases of erythematous, pseudo-membranous, ulcerative or pustular enteritis; with 113 of the same forms of colitis; with ninety of follicular enteritis; sixty-four of follicular colitis; and with twenty-eight of softening of the small, and thirty-five of softening of the large intestine.

Dr. J. Lewis Smith offers an analysis of the post mortem appearances in eighty-two cases of intestinal inflammation in children. The upper part of the small intestine, embracing the duodenum and jejunum, was found inflamed in twelve cases, while in fifty-one cases it was free from inflammation, and of a pale color. The ileum was inflamed in forty-nine cases, and the caecal portion, including the ileo-caecal valve, was the part in which the inflammation was uniformly most intense and to which it was often confined; in thirteen cases there was no enteritis whatever, and in sixteen there was no inflammation of the ileum, so that the ileum was inflamed in all but three cases where enteritis was present. On the other hand, in all the cases excepting one, namely, in eighty-one out of eighty-two cases, there were lesions indicating inflammation of the mucous membrane of the colon. In thirty-nine the inflammation had effected nearly or quite the entire extent of this portion of the intestines. In fourteen it was confined to the descending portion entirely, or almost entirely; in twenty-eight cases the records state that colitis was present, but its exact location was not mentioned.

In describing the lesions of entero-colitis, they will be divided into those found in the acute and chronic forms of the disease respectively, a division made for the sake of correspondence with the description of the symptoms, although the lesions found in the two stages differ from each other only in extent and degree. Thus, in the acute stage, the lesions consist of increased vascularity, thickening and softening of the mucous membrane of the intestine, and enlargement of the intestinal follicles; while in the chronic form, there is discoloration, thickening with infiltration, and induration of the walls of the intestines, and more extensive destruction of the mucous membrane from follicular ulceration.

In the acute stage, the increased vascularity (inflammatory hyperæmia) may present itself as a uniform, more or less intense, redness of the mucous membrane; an appearance which may sometimes exist in the duodenum, but far more frequently is observed in the lower end of the ileum, and in the colon. More frequently it takes the form of arborescent congestion, occurring in patches surrounding the enlarged follicles. The peritoneal surface may also be more or less vascular, and quite frequently there are little patches of redness, and arborescent vascularity corresponding to the bases of the inflamed mucous follicles.

The thickening of the mucous membrane usually corresponds to the degree of vascularity, and when the latter is but slight may be scarcely appreciable; while in other cases, and especially when associated with much enlargement of the mucous follicles, and œdema of the submucous tissue, the thickening is highly marked. The inflamed portions of the mucous membrane are also more or less softened, so that they can be detached from the subjacent coats more readily than in health. In some instances, the softening is so extreme that it is impossible to raise up the mucous membrane in strips at all. These lesions are all most frequent and marked in the lower part of the ileum and in the descending part of the colon. In addition to these changes in the color, thickness, and consistence of the mucous membrane, the mucous follicles are prominently enlarged. In the normal state the isolated follicles of the mucous membrane of the intestines, in young children, appear as minute, grayish-white bodies, and present a grayish point, the excretory orifice, which is only visible with the aid of a lens. In the course of entero-colitis, however, the morbid development which they undergo causes them to present the following characters: The isolated glands are enlarged, and seem, therefore, more numerous than in the healthy condition: they appear in the form of lenticular grains, seated in the texture of the mucous membrane, sometimes projecting from its surface, sometimes not, and in other instances appearing to be situated beneath it; the excretory orifices of the follicles are often enlarged and tumid, and easily distinguished under the form of a grayish or blackish point in the middle of the gland; in other cases the orifice cannot be distinguished until slight pressure is made upon the crypts, when a drop of turbid mucus may be seen exuding through the open point.

The color of the distended follicles is dull white, rosy or yellowish; they are generally from one-third to two-thirds of a line in

diameter. Dr. Horner speaks of them in this stage of development as resembling "small grains of white sand sprinkled over the mucous membrane, and about the size of a millet seed." The agminated glands, or patches of Peyer, are found in the same state of increased development; they are tumefied, and project above the level of the surrounding mucous membrane, and the orifices of the follicles are congested, so as to appear as dark points, giving to the patch a dotted, punctated appearance, which has been compared to the freshly shaven chin.

A little later the enlarged follicles present minute, oval, or round, yellowish spots upon their summits, which soften down, and allow the contents of the follicles to be discharged. The enlarged orifice of the follicle will then admit a small probe, and may even measure one-half line in diameter. It leads into a little cavity, which is the follicular sac. The mucous membrane, which overhangs this cavity like a fringe, is thus undermined, and partly cut off from its vascular supply, so that we may find a process of ulceration advancing in it, until the base of the distended follicle is exposed, appearing as a small, oval or round, shallow ulcer. The various conditions of the follicle may all be seen at the same time in a single portion of the intestine. The enlarged patches of Peyer often have the appearance of being ulcerated, but a careful examination will generally show that this is not the case. The appearance depends upon the enlargement of the orifices of the glands, upon unequal tumefaction of the surrounding mucous membrane, and upon the presence in the patch of small, irregular, grayish points, consisting of pultaceous matter, which makes the patch look more projecting and uneven than usual. If, however, the pultaceous layer be gently rubbed with a piece of linen, it can easily be detached, when the mucous membrane beneath is found red, softened, and thickened, but not ulcerated. In comparatively rare cases, however, there are superficial erosions of the mucous membrane, covering the prominent patch. The exact date at which the ulceration of the follicles begins, is as yet undetermined, and probably varies greatly in different cases. It frequently happens, however, that death occurs, especially from the supervention of a choleraic condition whilst they are still merely in a state of enlargement.

When, on the other hand, the disease passes into the chronic form, the lesions above described, becomes more and more extensive. This is especially the case with the lesions of the large intestine, for it is even more true of chronic than acute entero-colitis, that the chief seat

of the disease is in the colon. In chronic entero-colitis, the intestine is often contracted, and the peritoneal surface may present patches of discoloration. The thickening and infiltration have now affected the submucous and muscular coats, and have been followed by induration of the tissues, so that the walls of the intestine are often abnormally rigid. This is especially true with regard to the lower part of the descending colon and the rectum.

The mucous membrane is seen to be riddled not with mere superficial erosions, but with true ulcers affecting the whole thickness of the membrane. These ulcers when isolated are from one to one and a half lines in diameter, oval or circular in shape, and either have sharp cut edges, as though the mucous membrane had been cut out with a punch, or the mucous membrane bounding them is undermined. Frequently however, these ulcers coalesce, and at the same extent in depth, so that large, sinuous, irregular ulcers are formed, with thickened slate-gray undermined edges, and having for their base either the submucous or muscular coats which may be covered with a pultaceous, apparently pseudo-membranous layer of a grayish-white color. These ulcers include and surround irregular islets of mucous membrane, which are swollen, infiltrated, vascular, and discolored. That the large and deep ulcerations just described, even when most extensive take their start from the mucous follicles, is proven by the frequent presence amongst them of other ulcerations of more recent date, and smaller size, which present all the characters of the follicular ulcer, and show clearly the origin of the large and more advanced ulceration. Occasionally there is a marked deposit of pigment in the bases of the ulcers, and in some cases small coagula of blood have been found adherent to their bases. Allusion has already been made to the marked analogy between the disease under consideration, and the form of camp diarrhoea described by Woodward, and one of the most powerful arguments in favor of the essential identity of the two affections, is the perfect correspondence between their anatomical lesions. The following is a summary of the microscopic changes in the intestine during the development of these lesions as determined by the careful investigations of Woodward :

"In the early stage attended with thickening and softening of the mucous membrane, microscopic examination shows marked multiplication of the connective tissue cells about the base of the follicles, and soon the tissue is occupied by great groups of small, rounded or slightly polygonal cells. The delicate layer immediately beneath the

base of the follicles present, at first, enlargement and proliferation of its vesicles, whilst later it often ceases to be recognizable, being obscured by the luxuriant cell growth. In the most intense cases the cell growth here described as attained to the surface of the membrane, may take place throughout its whole thickness, and even involve the subjacent muscular layer. A similar proliferation takes place in the connective tissue, which lies between the follicles. The epithelial layer which invests the mucous membrane, and is prolonged into the tubular follicles, either is the seat of rapid cell multiplication, or is exfoliated and replaced by round granular cells from the adjacent connective tissue cells. The epithelial lining near the orifice of the follicles, appears to undergo these changes most rapidly, and with the greatest rapidity. The closed follicles also present rapid cell multiplication, which affects the parenchyma of the follicle, as well as their connective tissue of its capsule and the surrounding cellular tissue. Microscopic examination, shows the follicles distended with small rounded, granular cells, and imbeded in a luxuriant growth of similar cells, which render it almost or quite impossible to draw the line where the follicle terminates, and the surrounding tissue begins. Ulceration usually appears to originate in the rupture of one of the closed follicles, and the discharge of its softened contents into the intestinal cavity. This is followed by the liquefaction of the inter-cellular substance, and the consequent liberation of the broods of the minute cells into which the surrounding connective tissue has been transferred. Hence results one of the punched out ulcers described above. In the subsequent extension of the ulcerations by which large irregular sinuous ulcers are produced, the progress seems to take place chiefly in the sub-mucous connective tissue, the superficial part of the mucous membrane resisting the process until undermined and its nutrition supply cut off. Hence arises the excavated undermining character of the edges of the ulcers. From the anatomical point of view, it will therefore be perceived that the morbid process, in the cases in which there is no ulceration, is essentially the same as those in which ulceration is present. The one lesion is only a later stage of the other. Not unfrequently there will be found one or more intussusceptions of the ileum. These are usually readily restored, and have evidently occurred during the act of dying." Smith has however "in a few instances found intussusceptions which sustained the weight of two feet or more of intestine, without being reduced, and which from being in their interior more vascular than the contiguous membrane, had probably occurred some hours or days before death, but being sufficiently previous to allow the food to pass, the symptoms of obstruction were lacking."

The mesenteric and mesocolic glands are nearly always enlarged, the most marked enlargement corresponding to the lower end of the ileum, and the descending colon. The enlarged glands are of a pink color, and rather more soft and succulent than normal.

Stomach.—In a great majority of cases the stomach is quite healthy; in a few instances, however, there may be found congestion of the mucous membrane, slight enlargement of the mucous follicles, or softening of the mucous membrane, probably cadaveric in most cases.

Liver.—Many authorities, apparently led by the presence of symptoms supposed to indicate disturbance of the function of the liver, have assumed that there is in most cases of entero-colitis some morbid condition of this organ, but extended observation has disproved this view. Smith has published the result of thirty-two post-mortem examinations in regard to this point. Thus, he states, "There was no congestion or torpidity, or hyperactivity, or perverted secretion. The size of the liver was in some cases very different in those of about the same age, but probably there was no greater difference than usually obtains among glandular organs within the limits of health. In most of the cases the liver was examined microscopically, and the only fact worthy of note was the variable amount of fatty matter. Sometimes it was in excess, sometimes it was in moderate quantity, or deficient, and sometimes in greater amount in one portion of the organ than another."

The *thoracic viscera* present no constant or important lesion, though in a certain proportion of cases there may be found more or less hypostatic bronchitis, with collapse of portions of the lungs.

The *brain* presents no lesions dependent upon the disease, when death occurs during the acute stage. When the case has been protracted, and attended with much wasting of the solids and fluids of the body the brain also diminishes in size, and there is frequently found marked excess of subarachnoid effusion, in cases where the fontanelles have closed, while, if these spaces still remain unossified, they become markedly depressed. These appearances are, however, purely passive in their character, and depend upon wasting of the brain.

The *eye* has a pearly appearance, and sooner or later injections of the capillaries about the iris become so marked as to form a zone. This is quite characteristic.

Pathology.—The pathology of inflammatory diarrhoea is involved in great obscurity. We are now pretty well acquainted with the physical conditions under which the disorder is most apt to be developed. Early age, the period of dentition, high temperatures, improper food, residence in cities, and especially the crowded occupation of small and

illy-ventilated buildings, in narrow courts and alleys, where unhealthy exhalations arise from the decomposition of filth and dirt of all kinds are the chief conditions which precede the outbreak of the disease. But how these conditions act to produce the effect is still a matter of doubt. To attempt to reason upon a matter so full of difficulty seems almost useless, and yet we shall attempt to place before the reader some thoughts upon the subject.

There are two broad generalizations which we think, may be safely assumed to be true. 1. An unhealthy food, one incompetent to furnish the body what it needs for the purposes of nutrition, as farinaceous food or unhealthy milk, is sure to produce the disorder we are considering, no matter how favorable may be the circumstances, in all other respects, in which the child is placed. 2. The best breast milk in the world, or the most correct artificial diet will not save a child from this disorder, who is located in an ill-ventilated house in a dirty and filthy quarter of a large city during hot weather. Here the heat to which the child is exposed, the heavy air loaded with foul exhalations which it breathes, determines a condition of the health in which the digestive organs can no longer digest properly the food offered them. In both cases the same result is produced. In the first the stomach cannot change the originally improper character of the food into healthy material. In the second, the diseased and enfeebled organ loses the power to digest even proper food. In both the alimentary canal is filled with the products of an improperly digested food. Whether these unhealthy products in the alimentary canal act chiefly as local irritants to the mucous membrane, and thus determine the tissue changes met with or whether some morbid condition of the blood is brought about, which of itself gives rise to the changes in the mucous membrane through a morbid action of the diseased blood on the nervous system, and particularly on the sympathetic nerves it is impossible to say. Most probably they act in both ways. In either case a constitutional condition is brought about the essential feature of which is a slow innutrition or inanition, (athrepsia,) a condition partaking of the scorbutic seems to be induced, as after a length of time the general debility and blood alterations supervene, which bear a resemblance to scurvy.

Symptoms.—The most prominent are diarrhoea, colic, fever, vomiting, pearly appearance of the eye with corneal injection. In infants the acute form of entero-colitis generally begins with restlessness,

feverishness and fretfulness. The child sleeps less than usual, and for shorter periods, is uneasy and broken by sighing or moaning, or by occasional expressions of pain flitting across the face. It takes the breast less frequently, and is satisfied to nurse for a shorter time. At the same time it is apt to reject the milk which it had taken in larger quantities than usual, and this is often observed to have a very acid smell. After these symptoms have lasted a few days, and sometimes without them, the peculiar symptoms of the disease, the diarrhoea and other abdominal symptoms, make their appearance, and are accompanied by fever in most cases.

In older children the acute form may come on suddenly, with diarrhoea, loss of appetite, thirst, sometimes vomiting, abdominal pain and fever, from the first; or, as happens very frequently, the case begins with slight diarrhoea, unaccompanied by fever, or other signs of sickness, and it is not until after several days, that signs of inflammation make their appearance.

The *diarrhoea* is the most prominent and characteristic symptom and presents various characters. The practitioner ought always to see the napkins of the child. It exists in almost all cases of enterocolitis, in the erythematous and follicular inflammations, and in the ulcerations. It is seldom absent, and yet that it is so sometimes, is proved by the facts mentioned by Rilliet and Barthez, who state that they have calculated, from their cases, that it is wanting in about one of every twelve cases. They add, however, that it is absent only in slight attacks, and is always present when the disease is severe. It varies greatly as to the frequency, abundance, and characters of the stools. It varies also in its mode of progress, so that it presents great differences as to all these points from day to day, and at different portions of the same day. We may remark in general, however, that in proportion to the severity of the inflammation, so is the diarrhoea violent and constant, and that it usually increases as the signs of inflammation become more and more marked. It is rare to have severe diarrhoea when the anatomical lesion is of slight extent, though this does sometimes happen. The *number* of the stools, as has been stated, is exceedingly variable. This depends in great measure upon the violence of the case; for while in those which present the symptoms of an inflammation of small extent, the stools seldom amount to more than six or eight a day, in those in which the evidences of more extensive and severer inflammation are present, there will be

fifteen, twenty-five or even more per diem. The *consistence* of the stools may vary between that which characterizes them in a state of health, and that of the thinnest serous fluid. The *materials* of which they are composed consist chiefly of mucus, bile, serum, small portions of feculent matter, portions of undigested caseum or other food, and blood. The stools are usually at first, fecal, then green, then watery with green and white lumps, then brownish, finally may be slimy, and last of all bloody, and before death arrested entirely.

M. Bouchut (*Loc. cit.* p. 219), describes the stools of very young children as presenting the following characters: 1. They are semifluid, homogeneous, greenish, and similar to cooked vegetables, *e. g.*, spinach; neutral. 2. Semi-fluid, homogeneous and green; often acid. 3. Semi-fluid, heterogeneous, greenish, and mixed with yellowish fragments of ordinary faeces; neutral. 4. Semi-fluid, heterogeneous, greenish, and mixed with fragments of undigested caseum resembling duck's dung; acid. 5. Diffluent, greenish, heterogeneous, composed of a large quantity of water in which float yellowish and greenish, or whitish particles; acid. 6. Diffluent, greenish, like the preceding, and mixed with gas of a mawkish and sometimes a sourish smell. 7. Diffluent, completely serous. 8. Bloody stools are very rare at this age, except at times in the last stage.

After the first dentition the disease becomes much more rare, and when it occurs, is generally of a milder character, so that the discharges differ less from their healthy characters. Under these circumstances, they are usually less frequent, not often exceeding six, eight or ten in the day, and generally retain their yellow color or become brownish; they are commonly of a semi-fluid consistence, and may be called bilious. When, on the contrary, more frequent they become fluid, abundant, mixed with mucus, and are either of a light yellow or brownish, or more rarely of a greenish color. In some cases there are, in addition to the substances mentioned, pus, which indicates suppuration of the lower portion of the intestine, and fragments of false membrane. Moreover, it is very common in older children to observe traces of blood in the stools, sometimes in considerable quantities. The presence of blood generally coincides with small and frequent stools, attended with much straining, and often severe pain, and almost always indicates follicular inflammation and ulceration of the large intestine.

The serous, greenish fluid alluded to sometimes constitutes the whole of the discharge, so that the napkins are merely wetted through, without any or but a very small quantity of solid matter being left upon them. A serious colorless stool is very frequent in the cholera infantum. The *odor* of the stools is important. In the beginning, while the discharges still retain some of their natural characters as to color and consistence, it is often very offensive, but as the case goes on, and the greenish color predominates, it is either sour, or becomes very slight. In some violent cases, in which the discharge consists of a watery, dark brown fluid, the odor is fetid.

After diarrhoea, the most important symptoms are those which concern the *form*, *size*, and *tension* of the *abdomen*, and the presence or absence of *pain* or *tenderness* on pressure. In infants the abdomen is more distended than usual; but, according to Bouchut, the tension depends on the muscular effort made by the child to resist the hand of the physician. He says that when it is carefully examined, while the attention of the child is attracted in some other direction, it is found to be soft and supple, and rarely painful to the touch. In older children it is, in many acute cases, but not in all, enlarged, sometimes tense and sonorous, and very generally painful to the touch. The seat of pain is variable, but generally occupies one of the iliac fossæ or the umbilicus. It is seldom acute, though the child not unfrequently shrinks away and cries out, from fear of the examination, as though it were excessive. It is easy to distinguish when the pain is real and when apparent, by withdrawing the attention of the child, by some device, from the examination, in which case it will cease to notice the palpation more than is natural under the circumstances; or by touching some other part of the body, when, if the crying and shrinking depend on fear or nervous excitation, they will be as violent as when the abdomen is touched. Pain to the touch is an important symptom, as it is very generally indicative of acute enteritis. *Gurgling* is rare, according to Rilliet and Barthez, in ordinary entero-colitis, though very generally present in typhoid fever.

Vomiting is very common in young infants, and is generally repeated several times a day. In severe and rapid cases it is a very troublesome and alarming symptom. In older children it is much less common, and is never really violent, except in some of the most acute cases. In them it is confined to the first few days of the attack.

After the diarrhoea is fairly established, young infants are almost always either very irritable, peevish, and restless, or weak, languid,

and subdued. Their slumber is short and disturbed, and generally they sleep much less in the twenty-four hours than when in health. Older children are generally somewhat restless and irritable, but much less so than infants. There is seldom any disorder of the intelligence, though in acute cases there is sometimes slight delirium or headache.

Fever exists in all acute cases. It is seldom continuous in infants except for the first few days, after which it almost always assumes the remittent type. It is marked by increased frequency of the pulse, which rises to 120 and 140, or in bad cases much higher; by heat of skin, often intense during the exacerbations; by thirst and diminished appetite; and by dryness and heat of the mouth. In older children the pulse is not generally so high as in infants, and in many of the mild cases, the fever is very slight or there is none at all. In acute cases however, it is sometimes continuous and marked by rapid pulse and great heat of skin.

The *tongue* is generally normal, though sometimes red on the edges and tip in acute cases. It is seldom dry, except during the fever. *Appetite* is almost always lost, and *thirst* generally increased, though to a less degree than in diseases of the stomach.

The *countenance* is usually pale and the features are, according to Rilliet and Barthez, drawn down towards the inferior portion of the face. Emaciation always takes place as the disease progresses, and in very severe cases, occurs with the greatest rapidity, so that in a very few days the child will be reduced from an appearance of vigor and strength, to that of the greatest debility. As this occurs the flesh loses its firmness, the skin hangs in folds upon the trunk and limbs, and is dull and dirty in tint. The *eyes* become sunken and surrounded with bluish circles. They present a pearly appearance with injected capillary zones about the cornea. The whole appearance of the child is that of exhaustion.

In infants it is very common to meet with erythema of the buttocks and thighs, produced by the contact of the acrid stools and urine with those parts. This symptom is an early one and is said by Bouchut to exist in five-sixths of the cases. It does not exist in so large a proportion of those which occur in private practice, though it is met with in some instances. When severe it is generally accompanied by papules which ulcerate after a time and form superficial ulcerations upon the skin. These ulcerations sometimes run together, and erythema and ulcerations of the heels and internal malleoli are also met with, and constitute a serious complication in the case. They depend on

want of circulation, cleanliness, and the rubbing together of the feet of the child, unprotected by covering.

The *duration* of the disease is generally about fifteen days, at the end of which time convalescence is usually established. It may be shorter or longer. The disease subsides gradually. The stools become less abundant and more consistent, and return to their natural color and odor; the pain on pressure, and the enlargement and tension of the abdomen disappear; and as this occurs, the fever subsides, the appetite returns, the temper improves, and the child enters into full convalescence.

The *chronic form* of entero-colitis generally follows the acute, though it sometimes presents many of the features peculiar to it from the first. It differs from the acute form chiefly in the absence or the much slighter degree of fever and other constitutional symptoms in the early stage. The diarrhoea is less abundant and less frequent. At first the child retains its spirits and many of the signs of health. But gradually its strength fails, the temper becomes irritable, the complexion grows dark, sallow, and unhealthy, the skin becomes dry and harsh, and in consequence of the emaciation which takes place progressively with the other symptoms, hangs in folds around the shrunken extremities, or is drawn tightly over the joints and other osseous protuberances. The tongue is generally red and dry, whilst in others, it, together with the lips, partakes of the pallor which pervades all parts of the body. The abdomen is usually distended and sonorous on percussion, and may be painful or not on pressure in different cases, or in the same case at different periods of the disease; its parietes sometimes offer no resistance to the touch, so that the intestinal convolutions may be readily felt by the hand, or even between the fingers; and in some cases so thin and relaxed, though the abdomen be more prominent than natural, that the outlines of the intestines, and even peristaltic movements was visible upon the exterior. The appetite generally persists in spite of the gravity of the disease, and is sometimes increased. The stools, as has been stated, are not so frequent as in the acute form, seldom numbering over six or ten in the day and night. They consist of the products of an imperfect digestion, not unfrequently containing the alimentary substances in the state in which they are swallowed, mixed with mucus, serum, pus, and sometimes blood. Their consistence varies constantly, but they are usually semi-fluid. Their odor is seldom natural,

but often extremely offensive. This form of the disease corresponds to that known as athrepsia.

The *course* of the disease is very irregular. Even in the worst and most prolonged cases intermissions or remissions occur, so that the child will often improve greatly for days or weeks, and then suddenly relapse into as bad a condition as ever. In favorable cases these remissions become more and more frequent, and the symptoms gradually improve, until at length the child is restored to health. In fatal cases death is occasioned by the utter deterioration of the general health which finally occurs, and the child perishes, worn out by long illness, or, as more frequently happens, some complication arises which hurries on the fatal event. Thrush is a frequent complication of chronic entero-colitis, and doubtless often hastens the death by the impediment which it occasions to the nursing or feeding of the child. Vomiting has almost always occurred towards the close of the fatal cases, especially in those in which extensive thrush was present.

The *duration* of this form is of course very uncertain. It may last for weeks or months. Meigs has known it to last two and three months in several cases, and in two others it lasted with occasional intermissions, in one, one year, and the other eighteen months. This statement seems incredible.

Diagnosis.—The diagnosis of acute entero-colitis is not difficult. There is no disease with which it is likely to be confounded. The characteristic features of the malady are the diarrhea and other abdominal symptoms, and the absence of signs of other disease. The secondary cases are distinguished by the occurrence of the usual symptoms of entero-colitis during the progress of the primary malady.

The chronic form is not likely to be mistaken for any other disorder, unless it be the diarrhoea which occurs in tubular disease, from which it is to be distinguished by the presence in the latter, of signs of tuberculation of other organs.

Prognosis.—Acute entero-colitis is always a serious disease in infants. The prognosis will depend in great measure on the circumstances under which the affection has been developed. It is much more unfavorable in a child fed on artificial diet, either wholly or in part, than in one who is nursed at a fine breast of milk. It is more unfavorable also in weak and delicate than in robust and vigorous children, and in those of poor people, who live in crowded unhealthy portions of cities and towns, whose habitations are small, damp, and

ill-ventilated, and whose food is coarse and insufficient or improper, than in those placed in more fortunate and more healthful hygienic conditions. It is a more dangerous disease in summer than in winter. In hospitals for children it is a very fatal disorder, owing to the bad hygienic conditions under which the inmates are placed. In children, who have passed through the first dentition, the prognosis is, as a rule, favorable. The disease is seldom dangerous when it occurs as a primary affection, while as a secondary affection, on the contrary, it is much more apt to be serious.

The unfavorable symptoms are: Great frequency of the stools; collapse; violent vomiting or retching; and dangerous cerebral symptoms, as coma, rigidity of the limbs, paralysis or convulsions.

Treatment.—This is a disease that must be checked at once. To do this will tax the physician's skill to the utmost. As "an ounce of prevention is worth a pound of cure," we should know how to prevent as well as to arrest it. The *prophylactic treatment* is very important. It includes attention to *habitation, diet, dress and exercise*.

Among the most frequent causes of entero-colitis are high summer temperatures, residence in an unhealthy locality, and improper diet. A child may have been born of the most healthy parents; may be living, if an infant, on the most healthy food, the milk of a perfectly sound woman, or if it has been weaned on the best possible substitute for breast milk, one selected by the most consummate medical art, and yet if it be the unfortunate resident of some low crowded and unclean part of any of our cities in the summer season, it has but a small chance of escaping inflammatory diarrhoea or cholera infantum, to be followed by chronic diarrhoea. Or a child may be living in the best part of these cities, with every advantage that wealth and the medical art can give, and if in the period of the first dentition, and the summer heats be great, it will only be too apt to have one form of the disease we are considering. Under the latter circumstances its chance of escaping the disease will be vastly greater than under the first named conditions, but the true prophylaxis is where the parents are so situated as to be able to do that which is best for the child, removal from the city during the hot season into some cool and healthy region of country. The best region to spend the summer in is a somewhat high and cool part of the country, where the breezes have full sweep, and where the topography is such that water runs off rapidly or sinks fast into the soil. The sea or lakeside

if it be a point where there are no marshes or malaria, and where the supply of milk, and other wholesome food is abundant, is an excellent place. There are to be seen more remarkable sudden effects from the removal of a dangerously sick child to the sea or lakeside, than from a change to the interior; but nevertheless for a continued residence of three months, a high interior locality should be preferred. On the other hand, if a child be placed in the most favorable possible condition as to locality, and the diet be a radically bad one, a deficient or unhealthy breast, improper artificial diet, or a foolish allowance on the part of the mother or nurse to the child of a variety of vegetables, of fruits, and especially of berries like currants or gooseberries, it can scarcely escape the penalty, sickness, more or less severe. A child so unfortunate as to get a sharp attack of entero-colitis in June or July, is very apt to continue more or less sick during the rest of the summer, so that the true prophylaxis is to take it away from the city early in June to avoid this danger, and not to return until after the September heats are over. As the reasons for decisive medical action in any disorder cannot be too strongly demonstrated, and as this subject of removal is a very important one, it will be well to advert here to the results of experience in this matter in the diarrhoea and dysentery of our armies during the late war. Here we have the experience of intelligent army medical officers in vast numbers of cases — cases too so grouped together as to give opportunity for the most accurate observation.

In speaking of the causes and treatment of diarrhoea and dysentery in the army, Dr. S. B. Hunt says, "Great difficulty is experienced from the fact that the patient was still exposed to the causes of this malady, and it came to be a fixed doctrine at southern and south-western stations that confirmed cases had no security for cure except by removal to the north. This soon became a governmental policy, and hospitals were established in New England along the lakes and in the northwest, to which chronic cases were sent in great numbers. Among patients not thus removed, but treated in southern hospitals much vacillation, and irresolution were exhibited by the prescriptions of surgeons, as happens in all diseases, the treatment of which by drugs is unusually unsuccessful. To trace the history of an individual case was to find that the prescriber had run the round of all remedies, from *Opium* to astringents, from astringents to *Quinine*, from *Quinine* to *Bismuth*, and from *Bismuth* to *Nux vomica*, from *Nux vomica* to *Mercurials*, returning almost always to *Opium*. as the drug

which at least alleviated if it did not cure." The use of *Castor oil*, so successful in the hands of surgeon Beebe, doubtless never occurred to them.

The *dress* ought always to be suited to the weather. It is best to keep on the child, even in hot weather, a very thin and soft flannel shirt with short sleeves, or a loose band of light flannel with straps over the shoulders. This should never be removed. A young infant should wear all summer long unless during sweltering hot weather a thin and light flannel petticoat. A child a year old may have the flannel petticoat removed for a few days when the temperature rises above 85° or 90°, when it suffers evidently from the heat; but so soon as the temperature falls to 85° or below, the petticoat should be replaced. This happens only for a few days in the summer season, and the change should be made with great care, and only under the supervision of an intelligent and watchful mother or nurse. The child should not be bundled. "Dress according to the weather" is my direction.

Exposure to the open air is another point in the prophylactic treatment, which is of great importance. In country houses in the summer a young infant may get nearly as much air as it needs, but in cities the air is much more dull and stagnant, and the child ought to be carried out into the streets and parks for several hours morning and evening. If possible, it should be taken to drive into the open country. Short excursion by rail or boat, for the children of the poor, who cannot escape from the city in summer, are very useful in carrying the child safely through the summer. But in all such jaunts after health, the parents should so arrange matters that the child shall be as little fatigued as possible. The best plan is to go in the morning and return in the evening, resting through the middle of the day at some point where the child can take rest and mid-day sleep, which are quite as important as fresh air. Included in this subject is that of *exercise*. This becomes very important when the child is old enough to walk and run, for then an ignorant or thoughtless woman might think the more exercise the better, whereas it is necessary to watch such children very carefully, since if they are allowed or enticed to take undue exercise, the resulting of fatigue become a positive cause of diarrhoea. A child of two or three years old should not be induced to take long and continuous walks, it ought to frisk and play, not walk straight ahead like a man in training; for that kind of exercise we have remarked never suits children well. The child should be

kept out of the sun or even reflected rays of the sun, like sand, stone walks or houses.

Diet.—It has already been stated that one of the most frequent causes of the malady is the attempt to bring up the children on artificial diet, and particularly one of an improper kind. It is clear therefore that to avoid the disease it is necessary that the child should if possible be nursed. If this cannot be done, the diet ought to be wisely selected, and regulated in all its details by the physician. The one most proper is evidently that which most closely resembles the natural ailment of the infant.

Diet in the Attack.—After the disease has made its appearance, the diet should be carefully regulated. This constitutes, in truth, the most important point in the treatment. If the child is nursing, it ought to be confined entirely to the breast, and should the nurse have a large quantity of milk, must not be allowed to nurse very often, nor very long at a time. If there be the least suspicion that the milk of the nurse is unhealthy, it should be examined with the microscope, and if found to contain colostrum granules or is unhealthy in any respect, a new nurse must be provided. If the disease comes on shortly after weaning, and persists for several days in spite of careful diet and treatment, it is safest to restore the child to the breast. When this cannot be done, we must select that form of artificial diet which seems most suitable. The best is, in Meigs' opinion, the cow's milk prepared with the solution of gelatine in the manner already recommended, but made very weak for a few days. He has often found it necessary, under these circumstances, to add four and even more parts of water to the milk, instead of two or equal parts, as is the usual custom.

In older children the diet, for a few days, ought to consist of simple milk and water or barley or arrowroot water; after which thin preparations of arrowroot, rice-flour, sago, tapioca, or wheat flour, made with milk, or milk and water, with small quantities of bread, or, if the child refuse such articles, panada, or very thin chicken or mutton water may be allowed. The quantity of food, whatever it be, ought to be much less than usual, and in very severe attacks must be just enough to sustain the strength of the child, and no more. This system of diet is to be persevered in until the disease is removed, unless the child refuses it absolutely, in which case, we may allow pure milk, small quantities of ice cream, a little bread and butter, and small

portions of chicken or mutton, well cooked, and cut very fine. The return to old habits as the child recovers, or after full convalescence is established, ought to be made carefully and gradually, as there is no disease in which relapses are so apt to occur from neglect of this precaution.

Occasionally, indeed quite frequently, vomiting becomes a most troublesome symptom in entero-colitis. When vomiting becomes frequent and violent, so that the child rejects a large proportion of all that has been given to it, and when between the acts of vomiting, the little thing refuse almost everything that is brought to it, foods, water, etc., it is evident that the child has a more or less positive sense of nausea, which causes loathing of food. In such cases, unless all other means have failed, then of course, we must attempt to make it take concentrated foods in small doses. The better plan is at first to change the diet in toto — to abandon milk and all its preparations for two or three days, if these excite disgust and give light beef or chicken tea, just touched with salt, or raw beef, or, if this also is refused, cold extract of beef in one or two tablespoonful or wine-glassful quantities, or pieces of spicy and rich beef very slightly cooked, to be sucked. Or we may try small portions of yolk of egg hard boiled, or what Meigs often found was largely taken in such conditions, wine whey, of which he has given in the second year of life, as much as a tumblerful in twenty-four hours, and this without the slightest effect of undue stimulation, febrile heat or excitement. At the age of six months, ten to fifteen drops of brandy may be given every two or three hours in two or three ounces of milk and lime water; and at one and two years, from twenty to twenty-five drops in from four to six ounces of the milk food, every two, three, or four hours. Children in many instances have been known to take for days together milk with brandy in it who would not touch the milk without this addition. In such cases this preparation should be continued for a period. If all food is rejected and we deem it best to give the bowels entire rest, we may resort to milk baths or inunction of sweet oil or better yet sweet almond oil.

During the fever the use of *warm baths* at about 96° or 97° will be found of very great service. They should be employed once or twice, or even three times a day, if the heat of skin, frequency of the circulation, and restlessness, continue. It will often be found very beneficial to envelope the child in a warm blanket for half an hour after the bath, as this will sometimes produce fine perspiration.

Hygiene of Chronic Entero-colitis.—The management of the hygiene of the patient is more important than any other part of the treatment, in this, as in nearly all the diseases of the digestive organs in children; for cases will often recover when the diet, drinks, and exercise are properly regulated, without the use of any drugs whatever ; whereas, most assuredly, none, or but a very small proportion of them would terminate favorably under the best and wisest therapeutical medication, were the hygiene of the child entirely neglected. The remarks that have been made as to the diet most proper in the acute form will apply here. If the child has been weaned only a few weeks before the time at which we are consulted, and the case is at all serious, it is better to advise the procuring of a wet nurse. Cases of the disease which had resisted the most carefully managed artificial diet and therapeutical treatment, have recovered in a few days after the child had been restored to the breast. It is often, however, impossible to follow this course, from the refusal of the parents to obtain a nurse, or of the child to take the breast of a stranger, and we are obliged to rest content with artificial food. The kind of food which suits the largest number of children is one of milk. The addition of gelatine to the milk, to prevent the coagulation of the cow's milk into large, hard masses, has much to recommend it. It ought to be made very light and thin. About a scruple of gelatine should be dissolved by boiling in half a pint of water. Towards the end of the boiling, a gill of cow's milk, and a teaspoonful of arrowroot made into a paste with cold water, are to be stirred into the solution, and from one to two tablespoonfuls of cream added just at the termination of the cooking. It is then to be sweetened moderately with white sugar, when it is ready for use. The whole preparation should occupy about fifteen minutes.

For older children than infants within the month, the quantity of milk and cream should gradually be increased to half or two-thirds milk, and from one to two ounces of cream. The gelatine should not be increased [in quantity. A little arrowroot may also be added for the same purpose, having been previously mixed into a paste with a little cold water.

When cow's milk, mixed with water alone, or prepared in the manner just recommended, evidently disagrees, it will be found that cream with water alone, or better still, with the solution of gelatine in water, in the proportion of one part of cream to five or six of the

latter to suit very well. In other cases, very carefully prepared beef tea, chicken or mutton water, given several times a day, or but once, according to the taste and fancy of the child, will answer better. It sometimes happens that the child will refuse everything that has been mentioned, and yet the prostration and emaciation are such as to make it essential to procure some aliment that it will consent to take: Under such circumstances there should be given small portions of bread and butter, or stale sponge cake, with weak brandy and water, if the child is old enough to swallow solid food. Sometimes it will eat small quantities of meat, and when this has been the case there should be no hesitation to allow a chicken bone, with a little meat attached to it, or a piece of ham, or better still a portion of roast beef, or of the tender loin of beef-steak, to be held in the hand and sucked; or we may give the white meat of chicken cut up very fine, or torn into the finest shreds. Of the latter about a teaspoonful is sufficient for the first day, given with a little brandy and water.

The quantity can be gradually increased afterwards. There is another article sometimes given when children have been exhausted for want of food, and when they require constant change in order to be tempted to take it. This is the yolk of a *hard-boiled* egg, which has the great advantage of being very nutritious if digested, and of not being injurious, should it happen to pass into the bowel in a crude state, as it falls into a state of fine powder, which is not irritating to the mucous coat.

Raw beef, in many cases, minced very fine, and being separated from the cellular texture of the meat, and rolled into small balls with salt or powdered sugar, has been found to be readily digested, and to agree with the little patients.

The quantity as well as the quality of the food is of the utmost importance, and should be strictly regulated by the physician, and attended to by the mother or nurse. As a general rule, the child may be allowed as much as it wants of proper food, since the appetite is almost always greatly diminished, and it is not likely therefore, that too much will be taken. If, however, there is disposition to nausea or vomiting, or, if the appetite remains as good as usual, the quantity must be restricted. The difficulty, in most cases, is to get the patient to take enough, and not to prevent it from taking too much, for it is very often ascertained upon careful inquiry, that the quantity is entirely too small to support the strength of the constitution. A

hearty child, six months old, fed solely on artificial food, will generally take between a pint and a quart of fluid in the twenty-four hours, while at a year old, it will take usually fully a quart or more of fluid nourishment, besides eating small quantities of solid food. Now it is frequently known that children laboring under chronic entero-colitis, do not take more than one or two gills of food in the day, which is manifestly much too little. When this is the case, therefore, we should always endeavor to stimulate the appetite and digestion by causing to be presented to the child such a variety of food as may entice it to take a larger quantity than before.

In connection with this most important matter of the food, the army medical experience of Dr. Hunt will be again quoted from: "The bowels, enfeebled by the inflammatory process were unable to perform their normal function of the digestion of starches, and the diet became, therefore, necessarily albuminoid. A full nutritious diet of albuminoid and antiscorbutic food assumed the first importance in the treatment. Coupled with this came pure air and absolute cleanliness. And with these hygienic measures alone, when they could be properly enforced, it was possible to treat chronic diarrhoea with a fair degree of success, even in the great heat of a southern summer." These views are confirmatory of what has been asserted in the foregoing pages, that milk, meat, raw or cooked, broths, eggs, tomatoes, bread and butter, and even currant jelly, are important factors in the treatment of the form of the disease above described.

Therapeutics.—Not having been properly and generally recognized, the therapeutics of entero-colitis is mixed up with that of Dentition, Food, Indigestion, and especially Cholera Infantum.

The best analysis we have found is one by Dr. Holcombe, (U. S. Med. and Surgical Jour., vol. i, p. 1.) which we incorporate. It will form a very important nucleus for further additions.

Arsenic is perhaps our best Homœopathic similimum to erythematous inflammation; and the more so, since its effects are not chemical but dynamic, and, therefore, specifically through the general system. *Veratrum*, *Lachesis*, and *Carbo veg.*, from their many affinities to *Arsenic*, should not be lost sight of in these cases.

Of the irritant class, *Mercurius corrosivus* and *Kreasotum* are decidedly the best. The mineral acids, although producing similar phenomena, are not curative in these cases? Why? Because they produce the organic lesions first, by chemical affinity, and the general symptoms flow from the organic lesions. There is something specific about *Merc. cor.* and *Kreasotum*, and the same is true of *Argentum nitricum*, *Phosphorus*, and many other poisons.

A vast number of vegetable, and some animal poisons produce the anatomical lesions of inflammation throughout the alimentary tract. *Apis* and *Dulcamara* represent the first degree when there is intumescence, redness, etc. *Rhus tox.*—a second degree—where, in addition, the organic lesions are deeper and the vital depression greater; whilst *Secale cornutum* represents the last degree of softening and gangrene.

Arsenic and *Merc. corros.* possess great powers over the ulcerative form also. *Lycopodium* has in its pathogenesis many symptoms of the ulcerative process. *Croton tig.* will be found as valuable in such cases, as it is in painful, itching, suppurative, cutaneous diseases. *Borax* in high dilution and *Cinnabar* must not be forgotten. *Creasote*, *Terebinthina*, *Copraiva* and *Petroleum* are here Homœopathic and invaluable. For the chronic forms, *Sulph.*, *Hepar sulph.*, *Calc. carb.*, *Graphites*, *Lycopodium*, *Nitric acid*, and *Silicea* have great power. I once cured a long-standing, severe case of ulcerative colitis, promptly and permanently, with cod liver oil. Was *Iodine* the real agent at work or the oil? Finally, in some old obstinate cases, the directly irritant or substitutive method by *Argent. nit.* or *Cuprum sulph.*, in appreciable doses, is useful. *Tartar emetic* ought to be curative in ulcerations of the mucous membrane; and an Allopathic physician once told me that, years ago, he cured many cases of chronic dysentery with pills containing one-fiftieth of a grain of *Tartar emetic*.

The pustular form of inflammation is very rare. If it could be detected during life, *Croton tig.*, *Stibium* and *Thuja* might be specific.

The pseudo-membranous form, a genuine croup of the bowels, is also rare, yet it has been verified by many observers. Here *Iodine*, *Spongia*, *Kali bichromicum*, *Cinnabar*, *Bromine*, *Colchicum*, etc., would be useful.

The vomiting of children with entero-colitis is sympathetic, with the morbid state of the bowels, functional or organic, with the liver or with the brain. For vomiting from functional derangement, *Ipecac*, *Stibium*, *Lobelia*, *Nux vom.*, *Chamomilla* and *Pulsatilla* are Homœopathically indicated. Few cases will resist the judicious administration of the first two above named. That from organic lesions, either in the stomach or bowels, calls for *Arsenicum*, *Kreasotum*, *Argentum nitricum*, and *Lachesis*. *Sanguinaria* has served me admirably in many cases, not only of vomiting, but of pulmonary catarrh, indigestion, diarrhoea and dysentery, where *Ipecac* seems indicated. For bilious vomiting, *Nux vom.*, *Cham.* and *Colchicum* are ordinarily sufficient. If it persists, *Merc. dulc.*—covering better the real cause, hepatic congestion is indicated.

For cerebral vomiting, it would seem that *Cuprum* and *Zincum* ought to be the best remedies, being the most prompt and powerful emetics acting directly through the cerebro-spinal system of nerves. When there is vomiting, more from functional than organic disturbance of the brain, *Tabacum* or *Staphysagria*, Teste's specific for sea-sickness might be useful, or more probably Jousset's valuable prescription

or the obstinate vomitings of pregnancy, viz: *Plumbam met 12th* and *Opium 6th*—the former, every two hours during the day, the latter every two hours during the night.

Hiccough, coming on late in severe gastro-intestinal disease, is of exceedingly bad augury, and frequently coincident with a termination in gangrene. No special treatment is here of any avail. The remedies had better be chosen in accordance with the organic lesions or the constitutional disturbance. If very troublesome, a little iced champagne is palliative. The hiccough, which is a reflex action from various, widely different, and distant irritations, however annoying, is rarely dangerous. *Bell.*, *Hyos.*, *Cicuta*, *Coccus*, *Teucrium* and several other well known remedies seem to be indicated. I have cured one distressing case with the *oil of amber*. Nutmeg (*Nux moschata*) sometimes acts like a charm here.

Increased general peristaltic action results in the rapid and forcible ejection of stools; *Veratrum* and *Cuprum* are typical remedies. Increased partial contraction of the intestinal fibre is represented by *Colocynth*, *Senna*, *Gamboge*, and the gripping cathartics. This kind is very frequently relieved by very hot external applications.

Tenesmus is simply the vomiting or the coughing of the rectum. *Ipecac* is almost as good for tenesmus as it is for vomiting. *Merc. corros.*, *Aloes*, *Arsenic* and *Capsicum* are Homœopathic to the inflammatory form; *Nux vomica*, *Hyoscyamus*, *Anacardium*, etc., to the nervous.

Extensive tympanites without pain or muscular resistance, occurring late in entero-colitis, is a sign of sad prognostic import. Here *Carbo. veg.*, *Carbo. an.*, *Plumbum* and *Opium* offer the best prospect of relief. In less serious cases, where there is some pain and some muscular vitality, *China*, *Colocynth*, *Coffee* and *Ambra* are valuable; and still more so, but in material doses, *Asafætida*, *Oil of Anise* and *Turpentine*. The latter should also be freely rubbed into the skin.

Involuntary stools constitute a symptom of serious but by no means fatal omen. Sometimes the remedies Homœopathically called for, by the totality of the symptoms, have this also among their pathogenetic effects, as *Hydrocyanic acid*, *Camphor*, *Secale*. From *Bell.*, universally prescribed in the books for this symptom, I have never seen any good effect. A paralysis of the sphincter ani if accompanied with a considerable yawning of the outlet, I have always seen followed by a fatal result. (Consult *Phosphorus*.)

The implication of the blood system, either primarily or secondarily, in these intestinal affections, gives us some semeiotic phenomena of the highest importance.

Hæmorrhage is quite common in the beginning, in severe cases of infantile bowel disease. It is sometimes taken for dysentery, and the physician congratulates himself on the wonderful relief given by his specifics, and thinks his dysentery is disappearing, when the evolution of the case proves that it was entero-colitis from the first. *Ipecac*, *Hamamelis* and *Arnica* rarely fail in these cases. The next best

remedy is *Terebinthina*, in very small but yet appreciable doses. A second kind of haemorrhage comes from the disintegration of tissue resulting from the inflammatory process and its terminations. The above-mentioned remedies are still valuable in these cases, but inferior to *Mercurius cor.*, *Arsenicum*, *Kreasotum*, *Nitric acid*, etc. A third form of haemorrhage flows, not only from a softening and disintegration of the tissues, but from a dissolved and devitalized condition of the blood itself. *Arsenicum*, *Lachesis*, *Carbo veg.*, *Argent*, *Nitric acid*, *Hydrocyanic acid* represent this class.

Children with entero-colitis sometimes have burning fever from the beginning; sometimes scarcely any during the whole course; sometimes at the beginning only; sometimes only toward the close.

In this place we see the propriety, indeed the necessity, for the alternation of Homœopathic remedies. We frequently see patients with the local symptoms, functional or organic, of *Arsenic*; and the fever, not of *Arsenic*, but of *Aconite* or *Belladonna* or *Bryonia*. It is good theory to say, "remove the cause and the effect will cease." It is good practice to endeavor to remove both at the same time. The three articles above named, *Aconite*, *Belladonna* and *Bryonia*, have not been superceded in my estimation by any of the new remedies, *Gelsemium*, *Veratrum viride*, etc., some of which I have tried fairly, without finding them to compare with the old Hahnemannian Sampsons. One of the very best febrifuges for children is the tepid or warm water bath, frequently, but judiciously repeated.

Against the different constitutional cachexias arising from depraved nutrition, and of slow growth and chronic nature, we have invaluable remedies in *Calcarea carbonica* (a perfect treasure!) *Sulphur*, *China*, *Ferrum*, *Phosphoric acid*, *Arsenic*, *Sepia*, etc. But these great medicines are available but in a slight degree against the emaciation, the debility, and the innumerable functional and organic symptoms of an imperfect or depraved nutrition, which follows rapidly the steps of an acute intestinal disease. These remedies may be more useful when the acute disease supervenes upon a chronic constitutional state, to which they are more directly Homœopathic. Lacuzon and Teste prescribe with great confidence *Calcarea carbonica* 12, every four hours for thirty-six hours, followed by *Phosphoric acid* 12 in the same manner in cases of entero-colitis. For the same disease in very young children, Teste regards *Lycopodium* 30 as a specific.

In colic, however, which is a neuralgia of the abdominal ganglionic system, an intercurrent or alternating remedy at least is frequently demanded. *Colocynth*, *Cina*, *Plumbum* and *Colchicum* are here the typical remedies; or *Belladonna*, *Coffea* and *Chamomilla*, if the cerebro spinal system appears implicated.

Thirst is a symptom of real value. Insatiable thirst in a child, with entero-colitis, is a bad symptom. A constant desire to take the breast is not hunger, or an improving appetite, but thirst. *Belladonna* is the typical remedy for sthenic thirst, (with fever), *Arsenic* for asthenic thirst, (without fever). The pseudo-hydrocephalus or hydro-

cephaloid disease, which sometimes occurs in prolonged enteritis is an adynamic affection, generally beginning with drowsiness and terminating in convulsions, and requires brain *stimulation*. *Bryonia*, *Hellebore*, etc., are perfectly useless in this false hydrocephalus.

The general condition of the nervous system is a matter of the first importance. For nervous super-excitability, *Belladonna*, *Coffea*, *Synatia*, *Hyoscyamus*, *Stramonium*, *Asafætida*, *Agaricus*, *Kalmia lat.*, *Aurum*, *Argentum*, *Platinum*, *Nux moschata*, *Mochus*, and *Cannabis indica*. For nervous sub-excitability or insensibility, *Opium*, *Plumbum*, *Ithus tox.*, *Ruta*, *Causticum*, *Phosphorus*, *Secale*, *Kali bromatum*, and *Cuprum aceticum*.

What astonishing means of relief to suffering humanity, unknown to our Allopathic friends, are suggested to the Homœopathist by the enumeration of those glorious remedies !

From Guernsey, and other sources, under the head of cholera infantum, the following remedies and indications have been selected as bearing on this disorder :

Aconite.—Green, watery, frequent stools often from effect of low temperature in the room. If there is dry heat of the body and restlessness, there is likely to be vomiting.

Aethusa.—Violent attacks of indigestion usher in the attacks. The child lies stretched out in an unconscious condition with pupils dilated and a fixed and staring look. *Linea nasalis*. Face sometimes red and sometimes pale; mouth either moist or dry; vomiting of white, frothy matter without nausea. Vomiting and diarrhoea, with great prostration. Pulse sometimes imperceptible. Convulsions with clenching of the thumbs and turning downward of the eyes. Profuse vomiting of milk, which is thrown off as soon as taken. Milk in any form does not agree with the child, and excites vomiting. Constant thirst and great prostration. Vomiting of coagulated milk. Bilious, light yellow or greenish liquid stools, often with violent tenesmus.

Antimonium crud..—White coating on the tongue; nausea, retching, coughing, vomiting of bilious or slimy matter, renewed on taking food or drinks; green vomiting soon after nursing. Profuse watery diarrhoea, with vomiting of large lumps of curd; absence of thirst. The child is pale, fretful and peevish, turns itself away and cries when looked at or touched. Restless sleep.

Apis mel.—Summer complaint, which drags out week to week, slightly improving and then relapsing again until anaemia and nervous exhaustion have reached such a degree as to terminate in hydrocephaloïd. Diarrhoea not too frequent, mostly in the morning hours, vary-

ing much in character, sometimes very offensive, at other times hardly any smell. Greenish-yellow mixed with mucus or not too thin or watery, and mixed with little bits of fecal matter. The abdomen sunk in, but no hardness of mesenteric glands. No appetite nor thirst; tongue and skin dry, hands cold and blue (from venous stasis) Oppressed breathing; profuse urination at first, but now usually suppressed. Stupor more or less profound from which the child starts with a loud shrill scream. (Lilienthal). Compare *Belladonna*.

Arsenicum.—Severe attack or last stage. The child is very weak, and the slightest effort, such as vomiting, etc., seems to exhaust it. Intense thirst for cold water, with vomiting immediately after drinking. (Compare *Phosphorus*, *Æthusa*). Although the child constantly wishes to drink, it takes but a sip at a time. Simultaneous vomiting and purging. Stools dark green, dark watery, scalding, (acid) and offensive. Coldness of the extremities. The face is pale and cadaveric, and the skin is dry and shriveled, and may be hot. The child is very restless, constantly tossing to and fro, or wanting to change its position from arms to crib and back again. All the symptoms are aggravated after midnight.

Baptisia.—Very offensive diarrhoea day and night; the child can swallow nothing but milk; even the smallest quantity of solid food gags, i. e. after it has learned to eat.

Belladonna.—Sudden attacks or sudden aggravation. Great heat of the head and dryness of the mouth and lips. Dilated pupils. Tongue coated white, with red margins. The child wakes from sleep with a start, and is delirious, or is very sleepy, and yet cannot sleep. Sudden starting and twitching of muscles during sleep. Stools green, small and frequent, every diaper soiled a little. Worse in the afternoon. In nervous active (Irish) children. Compare indications under dentition.

Benzoic acid.—In children, especially during teething, with fetid, (acid) watery, white stools, very copious and exhausting. During stool, much pressing or straining. Strong smelling urine, mostly dark-colored. Troublesome dry hacking cough. Tongue coated with white mucus or ulcerated. Much exhaustion. Cold sweat on the head. Compare *Veratrum alb*.

Bismuth.—Diarrhoea and vomiting, but the latter prevails; all food and drink are thrown up at once; abdomen bloated; pale face; blue rings under the eyes.

Bryonia.—Aggravated by the return of every spell of hot weather.

When hot weather seems to develop the attack. The child vomits its ingesta *immediately*. Lumpy diarrhoea; colic, with much thirst, and desire for a large quantity of water at a time; lips dry and parched.

Calcarea carb.—In fat children during teething. Open fontanelles. Swelling and hardness of the abdomen, with emaciation and good appetite; flabby muscles; skin dry and shriveled; hair dry, looking like tow. Profuse sweat of the head when sleeping so as to wet the pillow. Stools whitish, gray, clay-like, watery and undigested, or involuntary; fetid, sour & frothy. Thirst at night. Urine pungent, fetid, clear. If caused or aggravated by lime water or lime stone water. *Lycopodium* is the antidote.

Calcarea phosphorica.—The child has had diarrhoea for some days; looks old and wrinkled, has a dry skin. Passages about every hour, white, papescent stools, offensive flatus. Longing for bacon or ham fat. Compare *Calc. c.* and *Phos*.

Camphor.—Last stage. Valuable antidote. The skin is cold as marble, yet the child will not remain covered. (Compare *Tabacum* and *Hyoscyamus*); much prostration and diarrhoea. Sometimes these cold spells only come on at night and pass off in the morning. Occasionally there is neither vomiting nor purging, but coldness and great prostration.

Carbo veg.—Last stage. Venous stasis. Similar to *Bryonia*; may be used when that remedy appears to be indicated, but fails to cure. Involuntary stools, which are very offensive, putrid or bloody; emission of large quantities of flatus either fetid or inodorous. Abdomen tympanitic, blue, skin cold, cold tongue, and breath cold, voice hoarse or lost. Worse from 4 to 6 P. M.

China.—Worse every other day. Very flatulent painless diarrhoea containing portions of ingesta; stools copious, fetid, and occurring immediately after eating. Partaking of fruit may have been the cause of the attack. Great weakness or inclination to sweat, or great prostration after a stool.

*Colostrum.**—Great nervous irritability, listlessness, pale face, tongue coated yellow or white; sour vomiting; watery diarrhoea with colic; sour watery stools; *the whole child smells sour*; excoriating diarrhoea, watery green, yellow with colicky pains in hypogastrium; fever; emaciation from the profuse, watery diarrhoea. (Burt).

* The active agent of what is called *Colostrum* is doubtless *Butyric acid*, or the liberated fatty acids. See Food, p. 301-4.

Croton tig.--Colic and diarrhoea immediately after nursing. The stools are liquid, yellow, and occur suddenly—one gush and it is finished—while or soon after nursing. The lips are dry and parched. Great prostration after a passage.

Dulcamara.—Diarrhoea from exposure in cold damp places. Every cool change in the weather or an unusually cool night, causes a relapse, or such condition of the weather appears to cause the attack at its onset. Stools are changeable, white, yellow, green, watery, sour smelling. Nausea accompanies the desire for stool. General prostration.

Ferrum pyrophos.—Painless and involuntary diarrhoea, with undigested food, after nursing; diarrhoea with nervous, spasmodic pains in the abdomen, back and anus; watery stools, with much flatulence, more frequent after taking food or drink (also *Arsenicum*); violent, exhausting diarrhoea.

Graphites.—Soft, dark, half-digested, very offensive stools, followed by great but transient prostration; sour stools, excoriating the external anus; eruptions on skin, from which oozes a gelatinous fluid.

Gratiola.—From drinking *large quantities* of cool water. Violent vomiting and purging of yellow substances, and much flatulence. Stools gushing out with force.

Helleborus.—White jelly-like mucus, with burning and smarting in anus; diarrhoea preceded by colic which is relieved after every stool.

Hepar sulphur.—Fetid stools; the child itself smells sour.

Ipecacuanha.—Much nausea and vomiting, or almost constant nausea; these symptoms predominate. Watery diarrhoea, or green, or, still more particularly, *fermented* stools. Great nausea, with pale face and oppressed breathing. Vomiting and diarrhoea at the same time.

Iris versicolor.—Tympanitis. Diarrhoea and vomiting of food, bile, or of very sour fluid; profuse, frequent, watery stools or mushy, pappy stools, attended with discharge of fetid flatus; burning in rectum and anus after stool.

Kreasotum.—Diarrhoea with vomiting; the continuous vomiting and straining to vomit predominate; the child resists the tightening of anything or squeezing around the abdomen, which increases the restlessness and pain; wants to be in motion all the time and screams the whole night; much thirst; hot gums, the teeth look black and decay as fast as they appear, with bronchial irritation. Coldness of hands and feet.

Lachesis.—Excessively offensive stools ; sudden diarrhoea with great urging. Thin, pasty, frequent stools during hot term. The child always awakens in distress.

Laurocerasus.—Severe cases. Pulse very slow and irregular or imperceptible. Slow, feeble breathing. When the child drinks, the fluid gurgles when passing through the oesophagus like the noise made by pouring fluid from an empty bottle. Green, watery stools. Suppressed or retention of urine. Dilated pupils.

Magnesia carb..—Stools green, watery, frothy, sour smelling, often with curds of milk, resembling the scum of a frog-pond ; sour vomiting with colic.

Mercurius sol.—Large head, open fontanelles, face pale, earthy. The child has colic, slimy and sometimes bloody or dark green stools, with tenesmus, the colic being relieved immediately after the stool. There is often perspiration, particularly upon the thighs, where it is cold and clammy particularly at night. The child is worse in the early part of the night, and is very weak. Sour smelling night sweats particularly on the forehead which feels cold (*Veratrum*). Sleep restless. Aphthæ.

Natrum sulph..—Frequent attacks of violent colic with rumbling in the abdomen ; relieved by violent discharges of yellow water, with large quantities of flatus ; stools more frequent during morning hours, after the child has been taken up and moved about.

Nitric acid.—Green mucous, bloody or putrid stools ; putrid smell from the mouth ; copious flowing of saliva from ulcers on the mouth and tongue ; exhaustion. Mercurealization or syphilis.

Nux moschata.—Diarrhoea with indomitable disposition to sleep ; stools offensive, copious, worse at night.

Nux vom..—In cases where some marked error in diet has caused indigestion ; or we may think of *Nux* after *Ipecac* has failed. Food of the baby was changed caused the diarrhoea ; stools frequent, small with straining, even much crying and straining when nothing is passed.

Oleander.—Frequent soiling of diapers when passing flatus, smelling like rotten eggs ; lienteria ; pale, sunken face in the morning, with blue rings around the eyes ; canine hunger and hasty eating without appetite i. e. evident relish.

Opium.—Diarrhoea from fright or aggravated by fright. This remedy has been given low to control the distress of the child, caused

by fright and pain, while *Arsenicum* was used to control the inflammation. It is better not to resort to such expedients if possible.

Enothera biennis.—Summer diarrhoea of children (brain diarrhoea) with great prostration; last stage.

Paulinia sorbilis.—(Guarana). Green, profuse, *inodorous* stools.

Phosphorus.—Parents consumptive; child tall and fair, with delicate mucous membrane. The child vomits its drink as soon as it gets warm in the stomach. The stools are very watery, and contain little lumps, that look like tallow. (Undigested casein.)

Phosphoric acid.—Because the diarrhoea does not weaken, the child is neglected. Long continued diarrhoea. Finally, great exhaustion; sunken eyes, with blue margins; stools are generally painless, white, watery and profuse. The little child is playful and laughing, while a stream of liquid stool will overflow the diaper.

Podophyllum p..—Great desire for large quantities of water, but none for food. Exceedingly offensive stools, which are large and most frequent in the morning; profuse and gushing, each seeming to drain the patient dry. Prolapsus ani with stools; moaning during sleep, with half-closed eyes, and rolling the head from side to side. Gagging, or ineffectual retching, or vomiting of green, frothy mucus, or of food. Deep inspiration; sighing. Violent cramps of the feet, calves and thighs.

Psorinum.—Dark brown, fluid stools, very offensive, like rotten eggs, (compare *Oleander*). Great debility, constant fretting and worrying. Dirty, sallow, greasy skin, with a partially developed eruption on forehead and chest. Profuse perspiration from the least exertion, and at night. Valuable as an intercurrent remedy.

Senna.—Dark colored, watery stools, with cutting pains, with flatulence. (Less severe than *Jalap*.)

Sepia.—Almost constant oozing from the bowels.

Secale.—Great debility, vomiting and diarrhoea; much thirst; pale face, sunken eyes, dry heat, quick pulse, restlessness and sleeplessness. Involuntary stools. Great aversion to heat, or being covered.

Sulphur.—Particularly in children of delicate parents. When there are repeated relapses, or when the case seems to linger, with excoriations between the thighs, redness about the anus; eruptions; weak spells; sleep, with frequent waking. Worse in the morning. The discharges are slimy, brown, green, or white, often marked with slight streaks of blood. Hot palms and soles of feet. Painful urination.

Veratrum.—Severe case or last stage. The least motion increases the nausea. Cold sweat upon the forehead, from the least movement of the body, or vomiting, with great prostration. Pulse almost imperceptible. The least quantity of liquid excites vomiting, which is followed by cold sweat on the forehead. Prostration, with cold sweat and cold breath. Stools profuse, consisting of greenish water, with flakes. Violent thirst for cold water.

Great reliance must be placed on the diet and care, as well as upon the remedy. The latter should not be continued after improvement is apparent, or harm (supposed relapse, etc.) will be the result. When food is found that agrees, it should not be changed for any trivial cause. Consult Food, and the indications under Dentition, Indigestion, Gastritis, Cholera, etc.

INTUSSUSCEPTION—INVAGINATION.

Intussusception is a slipping of one portion of the bowel into another. This condition is not often met with in private practice, but is of frequent occurrence among foundlings.

Symptoms.—As this condition of the bowels may occur during entero-colitis it may escape observation entirely. Usually there is severe colicky pains with tympanitis. There may be an arrest of stool or frequent and small passages. With this there may be vomiting first of the contents of the stomach, and then of the duodenum and jejunum, down to the point of constriction. The distress increases and, if not relieved, the child dies from exhaustion. The partial form may simulate colic or entero-colitis so closely as to escape notice. When the constriction is severe, there is usually more or less blood evacuated. This is looked upon as pathognomonic.

Anatomical Lesions.—In all the cases examined at the Foundling's Home of Chicago, there was a decided constriction of the gut, generally of the jejunum, which had given rise to inflammation and thickening. When in that condition this portion readily slips into the portion below, occluding it more or less completely. Adhesions frequently takes place from exudation of yellowish-gray, plastic lymph. If there is any undigested fibrin (casein) in the bowels, it is almost sure to lodge there. We have found as many as five invaginated portions of the intestines, extending from the duodenum to the cœcal valve. In one case there was also a point of invagination in the descending colon. It does not seem so frequent in the ascending colon in infants as in older children and adults.

Causes.—The cause is without doubt, spasm of the intestine, with rapid peristaltic motion, as occurs in colic. Long continued diarrhoea is often another cause of this condition.

Prognosis.—When severe, this is necessarily a grave if not fatal affection. Invagination of the colon is a rare and grave form, depending as it does upon a general depraved condition of the digestive apparatus. (Guersant).

Treatment.—This must depend much upon the cause, and seat of the constriction. If it set in during an attack of entero-colitis, such spasmodic remedies as *Belladonna*, *Nux vomica*, *Hyoscyamus*, or *Coffea* will suggest themselves. If due to violent spasm, consult remedies for colic. In addition to the remedy such local applications as a hot compress may be applied. The author once arrested a terrific case like magic by the external application of *Chloroform*. In another case where the trouble was located in the ascending colon, *Nux vomica* and enemas of warm water were alike prompt in arresting the fecal vomiting and enteralgia. The Allopathic expedient of course is narcosis by *Opium*. This palliative may be resorted to for humanity's sake, when all remedial efforts fail. At the same time, such a remedy as *Arsenicum* may be given as its action is not seriously interferred with by the *Opium*. When the cconstriction has existed some time, the case usually terminates fatally.

CONSTIPATION.

During the first two months of infantile life, constipation is not unfrequent, and diarrhoea rare, and for some time later in infantile life, may often recur.

Causes.—In some cases the constipation may be due to functional derangement of the liver, as in jaundice, where the stools may be hard, dry and clay-colored, showing a deficiency in the secretion of bile. Deficient or too tenacious intestinal mucus is another cause; the constipation of most febrile affections is mainly due to this condition, or to augmented perspiratory, or urinary secretions. Nervous, acid children are predisposed to constipation. The nutrient especially the amylaceous class, boiled milk, soups containing meal, rice, sago, etc., are another cause. Too slight peristaltic movement of the intestinal tube as a secondary effect in other diseases as hydrocephalus or atrophy is another causative influence. Mechanical obstructions, incarcerated hernia, intussusception, occlusions, etc., may also produce it.

Symptoms.—The evacuations may occur only once in twenty-four hours, or indeed even only once in two or three days, accompanied by great straining, or they may not occur until some kind of assistance has been given, the feces being hard and dry, and of a light color, and lay dry in the diaper like a dog's. The abdomen may be either distended by gas, or soft and flattened hard masses can be felt in the course of the transverse and descending colon. The general symptoms consist of loss of appetite, colicky pains in the abdomen, restless and disturbed sleep, headache, occasionally delirium, and in infants, convulsions. There is great pain in the rectum, and sometimes the gut is prolapsed, with passages of urine and blood, and there is frequently vomiting and symptoms of fever. All these may disappear entirely after the occurrence of a few evacuations. When the constipation is very obstinate, the motions, though passed daily, sometimes consist of thin worm-like masses, whilst the bulky and hard feces are retained. When the evil is of long standing and intense degree, the tympanitis may increase so much as to push the liver upward, the spleen cannot be detected by percussion, and the whole abdomen feels as tense as the head of a drum, on account of which it will naturally be painful to the touch. The children leave off eating, are very restless, attacked by eructations, and finally by vomiting, some fetid intestinal gas passes off with slight temporary relief, but all the symptoms disappear at once if one or more copious evacuations are produced.

Anatomical.—When the disease is of long duration, the tympanitis becomes chronic. Owing to the protracted anorexia, the patient become very much reduced, and, as a continuous compression of the abdominal veins, a marked collateral venous circulation forms beneath the abdominal integument.

Prognosis.—If there are no mechanical hindrances, such as have been enumerated the prognosis is always favorable.

Treatment.—The diet of either mother or child is at fault usually. In one case threatened with convulsions the mother took no dinners. Liquid food five or six times a day will usually correct this abnormal condition, oatmeal gruel between meals with plenty of milk and water, or chocolate, or cocoa shell tea at meal is an excellent diet for both mother and child. One of the following remedies may be needed :

Aconite.—Much heat about the child's head ; it is feverish, sleepless, restless, gnaws its fist, and its stools are hard and difficult.

Aethusa.—Constipation, with vomiting of the milk and other symptoms of this remedy. Milk seems to disagree with the child.

Alumina.—There seems to be a want of action in the rectum; the child has to make a very great effort even for a soft stool.

Apis m.—The child is restless, screams out in its sleep, and has bright red pimples on its skin.

Bryonia.—The stools are very dry, as if burnt, and of a dark color; dry lips and mouth. Alternation of constipation with diarrhoea. Soreness of stomach and heat of head.

Calcarea c.—Hard, undigested stools of a light color.

Collinsonia.—Chronic constipation with much flatulence; attended with haemorrhoids.

Graphites.—The stools are of an uncommon size, very large, and the child has more or less humid eruption over its body, behind its ears, on its face, on the chin, in its groins. This eruption exudes a watery, transparent, gelatinous fluid.

Hydrastis.—Constipation. A precious remedy, far superior to *Nux vom.* (Hughes). Excoriation of the anus or fissure, with piles.

Lycopodium.—Red, sandy urine, the sand is seen in the diaper; much flatulence; difficult stools, which is almost impossible to evacuate, when not caused by this drug in the shape of dusting powder.

Mercurius.—When the general symptoms of mercury are present, salivation, sore throat, glandular swelling, frequent efforts to evacuate; all these symptoms become more prominent every time the child takes cold.

Nitric acid.—This remedy cures many cases where the pain of evacuation is great during and after the passage, as though the little sufferer had fissures of the anus.

Nux vom.—This is the principal remedy and corresponds to the gastric derangement which accompanies the constipation. Stools large and difficult, or small, frequent and painful, with much colic. When the nurse takes much coffee or highly seasoned food. The child is quite sleepless and restless.

Opium.—Stools are in hard, round, black balls. If there is great fear with the passage.

Phytolacca.—Constipation of long standing. After stool sits a long time as if expecting more of a passage.

Platina.—The stools adhere to the rectum and anus like soft clay, so that it is difficult to discharge them. Early manifestation of

amorous feeling. Follows well after *Nux* especially when that remedy fails.

Plumbum.—The stools are composed of balls, like sheep's dung.

Sepia.—The stools are very difficult to discharge ; they remain in the lower part of the rectum and require assistance to expel them.

Silicea.—The stools are with difficulty forced to the verge of the anus, but they slip back again owing to lack of expulsive contraction of the sphincter ani.

Sulphur.—The child has intertrigo, pimply eruptions, swelling of the skin, soreness of the anus, so that it screams with every attempt to evacuate the bowels ; it seems to have piles.

Veratrum.—A paralyzed condition of the rectum requiring much straining, when a cold sweat appears on the forehead.

Enemas of warm water, milk, or oil may be resorted to for temporary relief.

DISEASES OF THE RECTUM.

DYSENTERY—RECTITIS.

Definition.—This is a very rare disease in infancy, still the author met a number of cases in the Foundling's Home in very young children having frequent bloody mucous stools, with tenesmus and fever.

Meigs and Pepper remarks that it seems unnecessary, to make more than a very few remarks on dysentery, as it almost always exists in children in combination with inflammation of the small intestines, constituting the disease already treated under the title of entero-colitis.

Dysentery, however, differs from the latter affection by the fact that it frequently occurs in an epidemic form, and that there is a tendency to more rapid and extensive ulceration of the mucous membrane of the rectum and colon. It is an acute febrile disease, characterized by frequent evacuations, attended by more or less severe pain and straining, and consisting of muco-sanguinolent, or sanguinous substances, which are due to ulcerative inflammation of the rectum and colon.

The causes of dysentery seem to be but little understood, beyond the mere fact that it occurs as an endemic in some regions of country, and as an epidemic over large districts. It is frequent, also, as a sporadic disease, and in this form seems to depend upon the same causes as those already cited as productive of entero-colitis. It may be either idiopathic or secondary. As a secondary affection it is most apt to follow measles and variola.

This disorder would appear in the majority of the cases, to be the result of sudden transitions of atmospheric temperature, particularly the sudden change from warm and dry, to cold and damp weather. It is most prevalent during the latter part of summer, or the commencement of autumn, when the days are hot, but the nights chilly and damp. It is apt to prove endemic in unhealthy localities, especially those favorable to the production of intermittent, remittent, or catarrhal fevers. A few days of cool, rainy weather occurring in the summer, will often cause the prevailing bowel complaints of children to assume a dysenteric character. (Condie.)

The *anatomical lesions* are confined chiefly to the rectum. The mucous membrane is commonly found thickened, swelled, red, and softened; the submucous tissue sometimes presents ecchymosed points; the follicles are often diseased, their orifices being enlarged and ulcerated. In grave cases, particularly those occurring under epidemic influence, there are usually more or less extensive ulcerations, which may implicate only the mucous, or extend to the muscular or even peritoneal coat. In such instances, pseudo-membranes also are often formed, sometimes in large quantity, and often covering the ulcerations. The intestine contains sanguinolent mucus, sometimes a brownish or greenish material, evidently the result of a gangrenous condition of the mucous membrane, pus, and lastly false membranes. In some rare cases, perforation has been known to take place.

Symptoms.—The disease is usually ushered in by nausea and vomiting, intense fever and abdominal pain. In the evacuations which at first are fecal, but later, are free from smell, yet again after the formation of ulcers, become extremely offensive, are to be found mucus, pus and blood corpuscles, epithelium, remains of food, vibriones and triple phosphates. The urine sometimes contains albumen. There is also brownish-white tongue, distressing thirst, great muscular weakness, whimpering, convulsions, and in older children, delirium, icteric coloring of the skin, and prolapse of the rectum. (Steiner).

The symptoms are much the same as those already described as existing in entero-colitis, excepting that the local symptoms are more severe, and the presence of blood in the stools nearly constant. The disease often begins as a *diarrhoea*. The stools at first contain feculent materials, but after a time become very thin, small in quantity, and consist chiefly of mucus mixed with blood. The blood may be black and in considerable quantity, or of a dark rosy red color, or like the washings of flesh; it is mixed with greenish or yellowish substances, whitish mucus fragments of false membrane, or purulent fluid. In young children there is evidently *pain*, from the restlessness, moving of the limbs, and crying about the time of the evacuations, while in those who are older, there is true *tenesmus*, like that observed in adults, and a severe pain in the anus. The number of stools vary according to the severity of the case. There may be only four, eight, or ten in the day, or very many more.

The *abdomen* is generally distended, tympanitic, warmer than natural, and painful. In mild cases there is usually no *fever*, or very

little, while in severe attacks, there is high fever during the first few days, marked by frequent pulse, hot dry skin, followed, after a time, unless a favorable change takes place, by coolness of the surface, contraction of the countenance, hollow, sunken expression of the eye, rapid emaciation, and death.

The *diagnosis* presents no difficulties. The frequency of the discharges, the pain in the course of the colon and in the anus, the tenesmus, and the character of the evacuations, all make the disease easy of recognition. The only disease it might be confounded with is entero-colitis.

The *prognosis* is favorable in mild cases, unattended with much fever, or very frequent discharges. When, on the contrary, there is violent fever in the beginning, followed by disposition to coolness and collapse; when the stools are exceedingly frequent, and attended with violent pain and almost constant straining; and when they consist of nothing but mucus, mixed with considerable quantities of blood, or with pus or false membrane, the prognosis is very unfavorable.

When the disease is primary, its course is generally more rapid and acute, but when due to gastric disturbances, it has a more chronic form. (Steiner.)

Prognosis.—Death may take place at an early period from the intensity of the inflammation, but in general it runs a protracted course, and the patient sinks finally, from extreme prostration, or a state of coma ensues, and death is preceded by symptoms of encephalic effusion (hydrocephaloid). (Condie).

Treatment.—Many of the suggestions given in entero-colitis apply here. The child should be kept quiet and the food should be starchy or if nursing, the mother should eat freely of starchy food. Flour gruel made with milk is one of the best articles of diet.

Aconite.—Much fever; dry heat; restless distress; an irritable or inflammatory state of the system. This remedy is often the specific for the entire case.

Aloes.—Stools in consistence like jelly cakes; a quantity of clear jelly, which may be green or white. Sometimes there is very severe pain, with straining and tenesmus.

Alumina.—Has to strain at stool in order to pass water; can pass water only while doing so.

Apis.—Frequent bloody stools, without pain. No thirst; restlessness; sleepless, usually during the latter part of the night. Screaming spells.

Arnica.—Frequent stools of clear mucus, with tenesmus. Bloody stools, or dark and bloody mucus, with sore pain.

Arsenicum.—Signs of great exhaustion; after any effort, such as turning over, having its diaper changed, etc., the little sufferer almost sinks from exhaustion. Stools very frequent, of a dark green mucus, or very dark and watery stools, looking like watered bile. Stools very offensive, sometimes corrosive; drinks little but often; great restlessness, turning and tossing with exhaustion. Aggravation from eating or drinking. Great and rapid emaciation. Often vomits water as soon as taken.

Baptisia.—Stools preceded by terrible colicky pains, when bloody mucus passes off, followed by great relief. Sometimes the stools are dark brown, and apparently fecal.

Belladonna.—Much tenderness about the abdomen, so that even a little jar is painful. Flushed face, red eyes; much bearing down pain. Moaning, jerking of the limbs while asleep or awake; bright bloody mucus, then green mucus, smelling sour; tenesmus during and after stool.

Bryonia.—When caused by cold drinks or very hot weather. The stools are thin and bloody; the child wishes to lie down and be quiet; when sitting there is nausea and a disposition to faint; thirst, with desire for large draught at a time. Vomiting of food soon after taking it. Parched lips and dry mouth.

Cantharis.—The discharges are apparently the scrapings from the mucous membrane, streaked with blood; the urine is burning and very scanty, often passed in drops, and with much pain. Sometimes there is complete suppression of urine, with great distress.

Carbo veg.—In very advanced cases; coldness of the breath; heat about the head; desire to be fanned; putrid evacuations; great debility; a venous condition is gaining the ascendency.

Chamomilla.—One cheek red, the other pale; very cross and fretful; thirsty; bloody and mucus stools. The child wants to be carried all the time. The difficulty has been caused by checked perspiration. Often vomiting of bile in the morning.

China.—The child is worse every other day; much flatulency and distention of the abdomen, particularly in the afternoon. Stools dark colored, and having a cadaverous odor which is terribly offensive. Great exhaustion, especially after stool.

Colchicum.—Autumnal dysentery; passages like transparent mucus.
Y*j

Sometimes the pain in the rectum and anus after stool is perfectly agonizing, and lasts a long while, causing screams and crying.

Colocynth.—The crampy pains are very severe, causing the child to double up with every stool. There is little or no straining. The stools consist of pure mucus or of bloody mucus.

Dulcamara.—If the dysentery is caused by exposure to cold and damp, or if it becomes worse as the weather grows colder.

Ipecacuanha.—Much nausea and vomiting, or constant nausea. Dysentery from eating sour substances or unripe fruit or vegetables. Loathing of all food; loaded tongue. Slimy, bloody and offensive stools, worse in the evening. Tenesmus during and after stools, or both. Autumnal dysentery.

Lachesis.—Dark colored stools of a cadaverous odor. Abdomen very hot; tongue red and cracked at the tip, or brown and bloody. The child awakes apparently much worse, as if in great distress.

Mercurius cor.—Very much pure blood is passed with the stool, with much tenesmus. Urine hot, scalding, causing crying and tenesmus vesicæ.

Mercurius sol.—Not so much blood, more bloody mucus, with tenesmus before and after stool. Much relief immediately after stool. Moist tongue and great thirst. Cold feeling in the abdomen, sometimes extending down the thighs and legs. Urine high colored. Cool perspiration. Sometimes the child will sit on the commode a long while after stool, as if it had not quite finished or did not wish to leave.

Nux vom.—A small portion of natural faeces is passed with every evacuation of blood and mucus; no appetite; sleepless towards morning. Stools frequent but small. Ineffectual urging.

Phosphorus.—Green and bloody discharges, the anus remaining constantly open. If able to talk, the child will complain of a weak, empty feeling across the abdomen. Tendency to relapse.

Podophyllum p.—Evacuations of bloody and green mucus, with tossing of the head from side to side. (Worse in the forenoon).

Pulsatilla.—Mucus streaked with blood; worse in the evening and through the night; no thirst. Great changeableness of the stools, so that no two are quite alike. The child is restless, and wants to be in the open air; seems to be smothered in the house.

Rhus is indicated in dysentery occasioned by getting wet, and also when it assumes a typhoid character. The stools are jelly-like, or like the scrapings of raw beef; involuntary; constant tenesmus and

urging to stool, with nausea; crampy, tearing pains running down the posterior parts of the leg; pains in the abdomen and limbs are worse from keeping quiet, and better from continued motion; patient is very restless, delirious, thirsty; accelerated, weak pulse; is worse at night, particularly after midnight. (Clinical Therapeutics).

Sulphur.—The passages make the perineum red all around the anus. In scrofulous patients, and in those with eruptions more or less numerous upon the body. Frequent relapses; the child seems to be doing well, when, without any apparent cause, it gets worse. (Compare *Phosphorus*).

Veratrum alb.—Great prostration after every evacuation, with cold sweat upon the forehead. Compare *Arsenicum*. (See Entero-colitis).

PROLAPSUS ANI AND RECTI.

This is a very common form of this disease of the rectum, especially in children of lax fibre. As Steiner remarks, the most common form of this is an extension of the mucous membrane covering the sphincters and lower part of the gut, appearing as a roundish tumor of a dark red color, glistening, bleeding on slight touch, and having an opening in the centre. Another and more rare variety consists of a true invagination, as instanced in a case under Steiner's care, of a boy three years old, where the upper part of the rectum and a portion of the descending colon, in all more than twelve inches long, protruded through the anus. When such protrusions have existed for some time they may be attacked by croupo-diphtheritic inflammation, ulceration, or even gangrene of the mucous membrane. Cases of invagination are sometimes fatal from purulent peritonitis.

Treatment.—This must include the removal of any exciting cause, such as diarrhoea or constipation, and the replacement of the prolapse. The child ought not to be allowed, if possible, to strain much, and for this purpose it is well to have the bowels moved while the patient is lying, or to place the utensil on a chair or stool, so that the child's feet cannot reach the ground. Injections of water are useful. Guersant recommends punctiform cauterization round the anus, and excision of some of the protuding mucous membrane has also been performed.

Invagination of the colon and rectum is a rare but dangerous condition, and is to be remedied by the replacement of the invagination by the finger or some appropriate instrument. Its retention may some-

times be secured by a mechanical appliance. The remedies indicated are either *Ignatia*, *Indigo*, *Nux vomica* or *Podophyllum*.

HÆMORRHIODS.

Hæmorrhoids are not often met with in young children. Still there are many cases on record by Boyer, Klein, and others. Bouchut in his recent edition, simply devotes a paragraph to it. Polypus, fissure, prolapse and piles may be confounded.

The treatment does not differ from that in adults. Hæmorrhoids being really due to obstruction of the portal circulation, the liquid diet of childhood is a valuable remedy as well as a preventive. For remedies, consult Constipation, Fissure and Prolapsus Ani.

FISSURE OF THE ANUS.

Fissure of the anus is such a rare affection among young children that few authors on infantile diseases even refer to it. Bouchut and Vogel being the chief ones. Mabboux records one case where a child only two months old suffered from fissure. Bojau describes a case in a girl four and one-half years. Rousseau reports two cases, both under one year old. The author met one case ten months old.

Symptoms.—In all cases defecation is very painful. The feces are hard, scybalous, and sometimes covered with blood. The general health is good and the infant feels well after defecation, but during the effort of stool the child is in great distress and does its best to prevent defecation. It strains violently and sometimes may have spasms.

Cause.—This distressing complaint is due to constipation, stretching and tearing the mucous membrane, or to spasm, constricting or pinching the mucous surface.

Diagnosis.—The child feeling well, except while at stool, would differentiate a fissure from colic or dysentery. It may be mistaken for constipation simply, but the great distress and blood on the stool serves to distinguish. The absence of polypi or haemorrhoids, and the examination of the rectum must decide. A thorough and careful examination of the anus pulling the nates far apart while the child is placed on its back with the body flexed, will usually reveal high up between the folds and parallel to them; a long superficial fissure. The sphincter is usually spasmodically closed.

Pathology.—Thorough examination reveals between the folds of the mucous membrane a superficial fissure or simple abrasure running parallel to the folds. They usually measure a line wide and about

three long. The anus is usually so constrictly spasmodically that exploration is difficult and very painful.

Treatment.—The first thing to be done is to regulate the diet and bowels. Old School authors speak of *Ratanhia*. Troussseau reports two cases cured with it. Mabboux ordered the regulation of the bowels and an ointment with extract of *Rutanhia* which cured his case in six days. Troussseau's treatment was *Ratanhia* extract five grains, aqua $\frac{3}{ii}$ by enema every day. One severe case occurred in the practice of the author where all sorts of expedients were used and many remedies as *Alumina*, *Podophyllum*, *Nux*, *Belladonna*, *Ignatia*, *Chamomilla*, *Calcarea*, *Silicea*, *Hepar sulphur*, *Aesculus*, were tried without lasting effect, when *Opium* 30 effected prompt and permanent relief. The child was teething and the bowels were only kept semi-liquid by giving a teaspoonful of sweet oil twice a day.

Lilenthal records as remedies for fissura ani: (1) *Ignatia*, *Nitric acid*; (2) *Petroleum*, *Plumbum*, *Sulphur*, *Natrum mur.*, *Phosphorus*, *Sepia*; (3) *Causticum*, *Silicea*, *Nux vomica*, *Thuja*, *Gratiola*, *Mezerium*, *Ratanhia*.

Graphites has fissures caused by large fecal masses, no irritability of the parts, no frequent desire for stool, no spasmodic contractions of the anus, only a smarting and soreness.

Nitric acid.—Sensation of constriction of the anus, painful, prolapsus of bowel; sharp, splinter-like, cutting pains in rectum during stool; burning after stool.

Poenia.—Ulcers of mucous membrane of rectum and anus, with fissure and burning, and biting some hours after stool. The parts seem swollen and exude an offensive moisture.

Ratanhia.—Burning in anus, like fire, preceding and accompanying defecation, and lasting a long time after it, accompanied by protrusion of varices. Burning in urethra while urinating.

Silicea.—Long and painful efforts to expel the contents of the rectum, but the sphincter ani seems tightly to resist the effort, till suddenly the stool passes, sometimes with pain and nervous shuddering.

Consult also Food and Constipation.*

POLYPUS OF THE RECTUM.

This is a rare affection, especially in young children, and is only mentioned here so that it may be looked for in rectal troubles. When met with the polypus is generally close to the anus, seldom

* For a more full discussion, see Diseases of the Rectum, by M. Ayers.

high up, of the size of a hazel-nut or cherry, readily bleeding, generally protruding at stool, especially when pedunculated, and giving rise to colicky pain and ultimate anaemia from loss of blood.

Diagnosis.—It may be mistaken for a worm, especially when pale.

Treatment.—Spontaneous separation by elongation and final tearing of the pedicle sometimes occurs. Removal of the growth, when necessary, may be done either by the scissors or ligature, the latter being preferable, to obviate the risk of haemorrhage. Polypi depend upon a constitutional (sycotic) condition. The chief remedies are : *Calcarea phosphorica* and *Teucrium*. *Sanguinaria* has also cured cases for Jahr.

Jahr says that for frequent protrusion of the rectum, he knows no better remedies than *Ignatia* and *Nux vomica*, and if these should not suffice, *Sepia* and *Calcarea*. If the fallen rectum is at the same time inflamed, *Aconite* often helps, or *Mercurius*. If it falls while urinating, and is not helped by *Ignatia* or *Nux vomica*, then *Muriatic acid* may be given. If caused by walking, *Arnica* or *Sepia*. If caused by diarrhoea, *Ruta* or *Hamamelis*.

STRICTURE AND OCCLUSION OF THE RECTUM AND ANUS.

These are not common in children, and when met with are nearly always congenital, the latter occurring most frequently as *atresia ani*.

Intra-uterine peritonitis and ulceration of the mucous coat of the intestines have also been noticed as causes of these conditions. They may also be occasionally met with arising out of some such process occurring after birth, or from the presence of some foreign body.

Symptoms.—Congenital stenosis is marked by the passage of very little or no meconium, paroxysmal pain swelling of the abdomen, and the onset of sickness, which lasts until death, unless relief can be given, and the symptoms of any acquired constriction are very much the same.

The treatment of any obstruction must be regarded by the cause, though in most cases it can only be surgical, as in the case of atresia, when, if the gut cannot be reached from the perineum, it may be opened in the left loin or the small intestines may be opened in the groin. In other cases inflation of the intestine from below, have been recommended.

Worms and other foreign bodies will be treated of subsequently.

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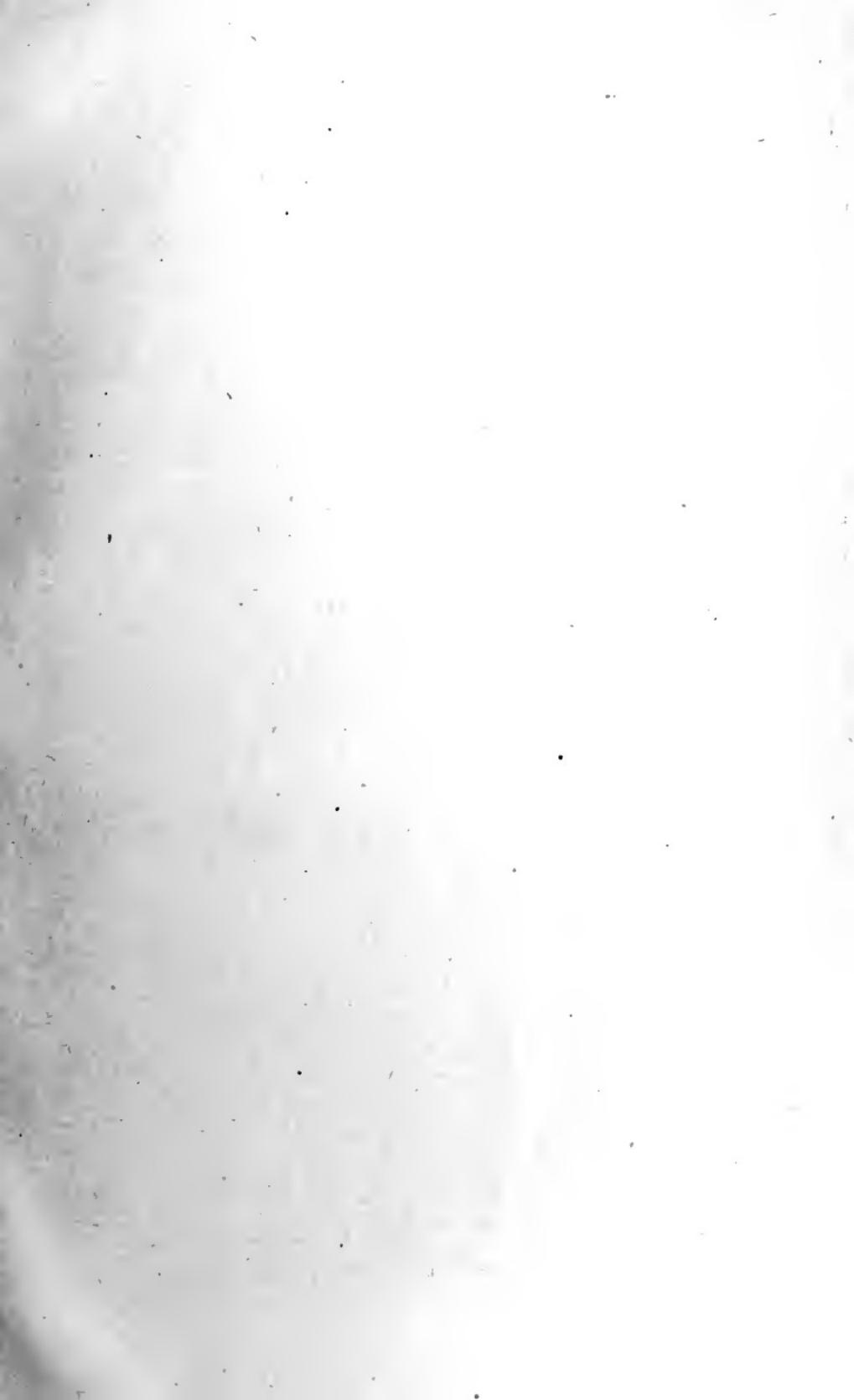
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